ARTISAN CROSSING
1325 COUNTY ROAD, BELMONT

Air Quality Assessment

Belmont, California

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INTRODUCTION

The report addresses air quality issues associated with the proposed Artisan Crossing project at 1325 Old County Road in Belmont, CA. The project proposes a 4-story, 250-unit multi-family residential building over a 1-story below grade parking garage basement with 259 parking stalls. The existing site consists of various commercial uses to be demolished and replaced with the proposed project.

Much of the air quality impacts associated with the proposed project were addressed under the *Draft Program Environmental Impact Report for the Belmont General Plan Update, Phase I/Interim Zoning, Belmont Village Specific Plan, and Climate Action Plan, Chapter 4.2: Air Quality.* The project would be consistent with the development proposed under the Belmont Village Specific Plan. Impacts and mitigation measures pertaining to the proposed specific plan development were identified. This included project-specific impacts. The focus of this air quality study is to address impacts associated with toxic air contaminant (TAC) exposure associated with project construction and exposure of project occupants to TAC sources near the project site (i.e., within 1,000 feet).

Draft Program Environmental Impact Report for the Belmont General Plan Update, Phase I/Interim Zoning, Belmont Village Specific Plan, and Climate Action Plan

The Draft Environmental Impact Report (DEIR) identified significant impacts with respect to construction period emissions (Impact 4.2-2). Projects constructed under the Belmont Village Specific Plan are subject to mitigation measures contained in the DEIR. Specifically, Mitigation Measure AQ-1 and AQ-2 affects construction TAC emissions by requiring the use of construction equipment that meets current U.S. EPA standards and use of renewable diesel fuel:

> ***Mitigation Measure AQ-1****: Require Tier 4 engines on Construction Equipment. All applicants proposing development of projects within Belmont shall require their contractors, as a condition of contract, to further reduce construction-related exhaust emissions by ensuring that all off-road equipment greater than 50 horsepower (hp) and operating for more than 20 total hours over the entire duration of construction activities shall operate on an EPA-approved Tier 4 or newer engine. Exemptions can be made for specialized equipment where Tier 4 engines are not commercially available within 200 miles of the project site. The construction contract must identify these pieces of equipment, document their unavailability, and ensure that they operate on no less than an EPA approved Tier 3 engine. ARB regulations will result in the percentage of Tier 4 engines increasing over the next several years.*
>
> ***Mitigation Measure AQ-2:*** *Require Construction Fleet to Use Renewable Diesel. All applicants proposing development of projects within Belmont shall require their contractors, as a condition of contract, to reduce construction-related exhaust emissions by ensuring that all off-road equipment greater than 50 horsepower (hp) and operating for more than 20 total hours over the entire duration of construction activities shall operate on renewable diesel (such as Diesel high performance renewable). Renewable diesel is currently commercially available in San Francisco Bay Area.*

The DEIR identified significant impacts associated with exposure of sensitive receptors to substantial pollutant concentrations because project may expose new sensitive receptors to significant health risks associated with TAC exposure. To address this issue, Mitigation Measure AQ-6 requires future projects located within 1,000 feet of sensitive receptors to perform a construction health risk assessment:

> ***Mitigation Measure AQ-6:*** *Require Future Projects Located within 1,000 Feet of Receptors Perform a Construction Health Risk Assessment. All applicants proposing development of projects within 1,000 feet of existing sensitive receptors, as defined by the Bay Area Air Quality Management District (BAAQMD), shall prepare a site-specific construction health risk assessment (HRA). If the HRA demonstrates, to the satisfaction of the City, that the health risk exposures for adjacent receptors will be less than BAAQMD project-level thresholds, then additional mitigation would be unnecessary. However, if the HRA demonstrates that health risks would exceed BAAQMD project-level thresholds, additional feasible on- and offsite mitigation shall be analyzed by the applicant to help reduce risks to the greatest extent practicable.*

This report evaluates the project's construction air quality impacts, with respect to TAC exposure at nearby sensitive receptors (e.g., existing residences). In addition, this assessment describes the effects of nearby TAC sources upon future residents occupying the project site.

SETTING

The project is located in San Mateo County, which is in the San Francisco Bay Area Air Basin. Ambient air quality standards have been established at both the State and federal level. The Bay Area meets all ambient air quality standards with the exception of ground-level ozone, respirable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).

Air Pollutants of Concern

High ozone levels are caused by the cumulative emissions of reactive organic gases (ROG) and nitrogen oxides (NOx). These precursor pollutants react under certain meteorological conditions to form high ozone levels. Controlling the emissions of these precursor pollutants is the focus of the Bay Area's attempts to reduce ozone levels. The highest ozone levels in the Bay Area occur in the eastern and southern inland valleys that are downwind of air pollutant sources. High ozone levels aggravate respiratory and cardiovascular diseases, reduced lung function, and increase coughing and chest discomfort.

Particulate matter is another problematic air pollutant of the Bay Area. Particulate matter is assessed and measured in terms of respirable particulate matter or particles that have a diameter of 10 micrometers or less (PM_{10}) and fine particulate matter where particles have a diameter of 2.5 micrometers or less ($PM_{2.5}$). Elevated concentrations of PM_{10} and $PM_{2.5}$ are the result of both region-wide (or cumulative) emissions and localized emissions. High particulate matter levels aggravate respiratory and cardiovascular diseases, reduce lung function, increase mortality (e.g., lung cancer), and result in reduced lung function growth in children.

Toxic Air Contaminants

Toxic air contaminants (TAC) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer) and include, but are not limited to, the criteria air pollutants. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, fuel combustion, and commercial operations (e.g., dry cleaners). TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter [DPM] near a freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, State, and federal level.

Diesel exhaust is the predominant TAC in urban air and is estimated to represent about three-quarters of the cancer risk from TACs (based on the Bay Area average). According to the California Air Resources Board (CARB), diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB, and are listed as carcinogens either under the State or Federal programs.

CARB has adopted and implemented a number of regulations for stationary and mobile sources to reduce emissions of DPM. Several of these regulatory programs affect medium and heavy-duty diesel trucks that represent the bulk of DPM emissions from California highways. These regulations include the solid waste collection vehicle (SWCV) rule, in-use public and utility fleets, and the heavy-duty diesel truck and bus regulations. In 2008, CARB approved a new regulation to reduce emissions of DPM and nitrogen oxides from existing on-road heavy-duty diesel fueled vehicles.[1] The regulation requires affected vehicles to meet specific performance requirements between 2014 and 2023, with all affected diesel vehicles required to have 2010 model-year engines or equivalent by 2023. These requirements are phased in over the compliance period and depend on the model year of the vehicle.

The BAAQMD is the regional agency tasked with managing air quality in the region. At the State level, the CARB (a part of the California Environmental Protection Agency [EPA]) oversees regional air district activities and regulates air quality at the State level. The BAAQMD has recently published California Environmental Quality Act (CEQA) Air Quality Guidelines that are used in this assessment to evaluate air quality impacts of projects.[2] *Attachment 1* includes detailed community risk modeling methodology used in this assessment.

Sensitive Receptors

There are groups of people more affected by air pollution than others. CARB has identified the following persons who are most likely to be affected by air pollution: children under 16, the elderly over 65, athletes, and people with cardiovascular and chronic respiratory diseases. These groups are classified as sensitive receptors. Locations that may contain a high concentration of these sensitive population groups include residential areas, hospitals, daycare facilities, elder care facilities, elementary schools, and parks. For cancer risk assessments, children are the most sensitive receptors, since they are more susceptible to cancer causing TACs. Residential locations are assumed to include infants and small children.

Significance Thresholds

The thresholds identified in Table 1 represent the most recent guidance provided by BAAQMD that are used by the City of Santa Clara. These are the thresholds used in the LSAP EIR for addressing air quality impacts. Though not necessarily a CEQA issue, the effect of existing TAC sources on future project receptors (residences) is analyzed to comply with the Clean Air Plan key goal of reducing population TAC exposure and protecting public health in the Bay Area.

[1] Available online: http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm. Accessed: November 21, 2014.
[2] Bay Area Air Quality Management District. 2017. BAAQMD CEQA Air Quality Guidelines. May.

Table 1. Air Quality Significance Thresholds

Health Risks and Hazards	Single Sources Within 1,000-foot Zone of Influence	Combined Sources (Cumulative from all sources within 1,000 foot zone of influence)
Excess Cancer Risk	>10 per one million	>100 per one million
Hazard Index	>1.0	>10.0
Incremental annual $PM_{2.5}$	>0.3 $\mu g/m^3$	>0.8 $\mu g/m^3$
Note: $PM_{2.5}$ = fine particulate matter or particulates with an aerodynamic diameter of 2.5µm or less.		

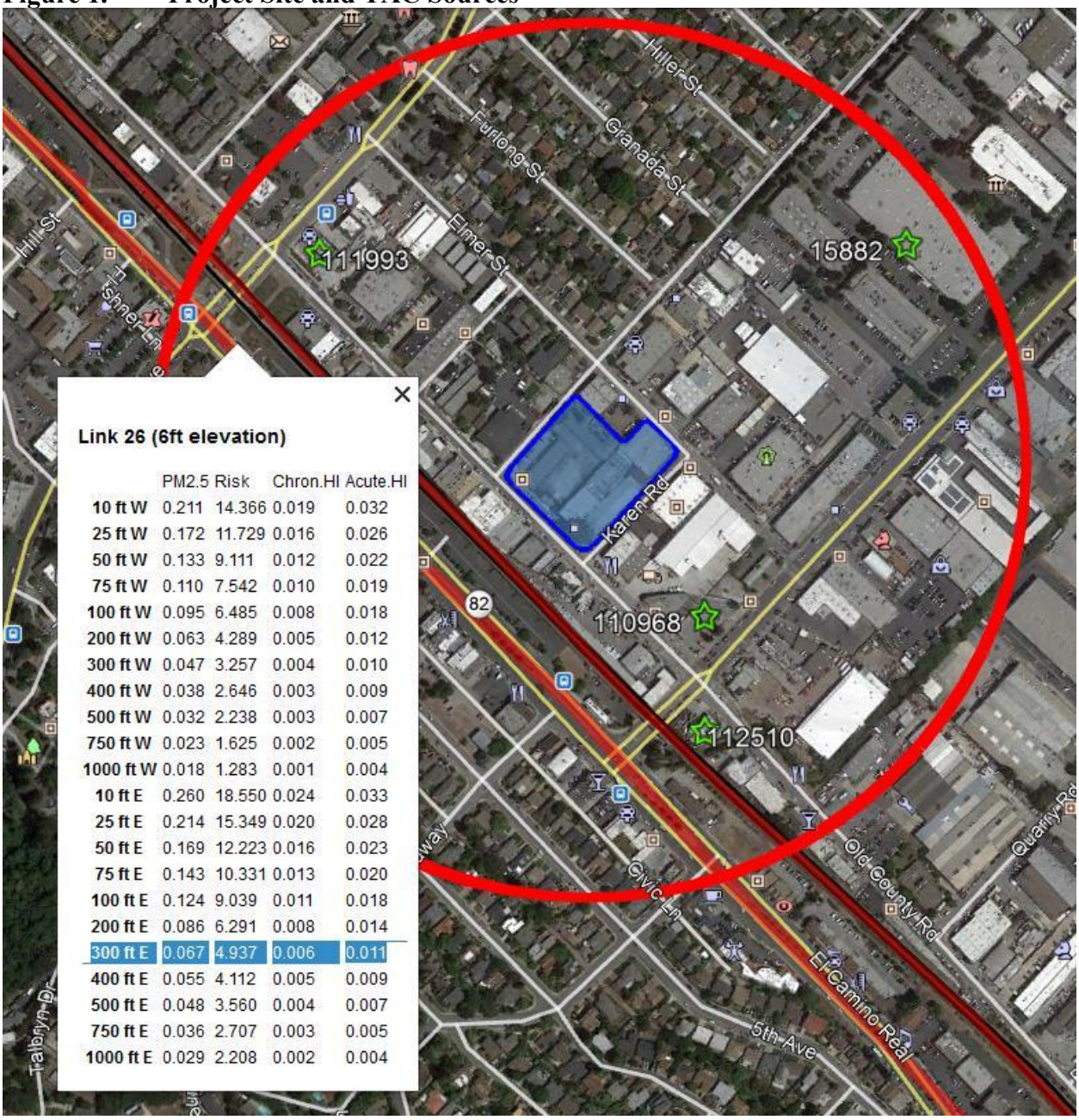
PROJECT OCCUPANT TAC AND $PM_{2.5}$ EXPOSURE

Sources of TAC and $PM_{2.5}$ emissions near the project site include El Camino Real (State Route 82), the CalTrain railroad, and several stationary sources. The influence of these sources upon the project site are shown in Table 2. Results indicate that there are no sources that alone pose risk greater than the BAAQMD recommended community risk thresholds (see Table 1). Combined, the sources do not exceed the cumulative community risk thresholds. No additional air quality measures are necessary to protect new occupants from these sources. The sources of TAC and $PM_{2.5}$ emissions near the project is depicted in Figure 1. The contribution from these sources is described below. Details of the modeling and community risk calculations are included in *Attachment 2*.

Table 2. Community Risk Impacts to New Project Residences

Source	Maximum Cancer Risk (per million)	Maximum Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)	Maximum Hazard Index
El Camino Real – Link 26 (6ft elevation) – 300 feet east	6.8	0.07	0.01
Plant #111993 (Gas Station) at 700 feet	1.6	N/A	0.01
Plant #15882 (Generator) at 810 feet	0.1	<0.01	<0.01
Plant #110968 Gas Station) at 350 feet	0.6	N/A	<0.01
Plant #112510 Gas Station) at 560 feet	1.0	N/A	0.01
CalTrain with electrification – 200 ft east	4.8	0.01	<0.01
Single Source Maximum	6.8	0.07	0.01
Cumulative Total	14.9	<0.09	<0.06
BAAQMD Threshold – Single/ Cumulative Sources	***>10.0/100***	***>0.3/0.8***	***>1.0/10.0***
Exceed Threshold?	***No***	***No***	***No***

Figure 1. Project Site and TAC Sources



El Camino Real

BAAQMD's Highway Screening Analysis Tool was used to predict screening risk levels associated with this roadway. The cancer risk was adjusted upward by a factor of 1.3744 to account for new cancer risk guidance recommended by the State's Office of Health Hazards Environmental Assessment (OEHHA). A description of the risk methodology is contained in Attachment 1.

Stationary Sources

BAAQMD's Stationary Source Screening Analysis Tool was used to identify stationary sources and their screening risk levels at the sources. BAAQMD provides distance multipliers for diesel generator and gasoline dispensing facility (GDF) sources that adjust the source level for the distance between the receptor and source. Note that several sources were identified that are permitted by BAAQMD but do not emit TACs in sufficient quantities to cause elevated health risk levels (e.g., auto body shops with paint spray booths).

CalTrain Community Risk Impacts

The project site is located 200 feet northeast (upwind) of the CalTrain rail line that currently generates TAC and $PM_{2.5}$ emissions from locomotive exhaust. This rail line is used primarily for passenger service; however, there is some freight service by trains using diesel fueled locomotives. The Peninsula Corridor Electrification Project is a key component of the CalTrain Modernization Program that would electrify the CalTrain Corridor from San Francisco to San Jose. Under this program, diesel-locomotive hauled trains would be converted to Electric Multiple Unit (EMU) trains after 2020.

Currently all of CalTrain's trains use diesel locomotives. As part of the program to modernize operation of the CalTrain rail corridor between San Jose and San Francisco, CalTrain is planning to switch from diesel locomotives to use of electric trains in the near future.[3] Nearly all of the trains in the future are planned to be EMU trains, which are self-propelled electric rail vehicles that can accelerate and decelerate at faster rates than diesel power trains, even with longer trains. This plan was formally adopted on January 8, 2015 and electrified service is anticipated to begin in 2020 or 2021[4].

Based on the current CalTrain schedule, there are 92 trains passing the project site during the weekdays, 32 trains during the weekend, and 4 trains that only run on Saturday. Electrification of CalTrain would eliminate DPM emissions from most of these trains. In addition to the CalTrain trains, there are about four freight trains that also use this rail line on a daily basis.[5] CalTrain plans are that in 2021 service between San Jose and San Francisco would use a mixed fleet of EMUs and diesel locomotives, with approximately 75% of the service being electric and 25% being diesel. In 2021, some peak service trains would be diesel on weekdays. All other service, including off-peak periods, would be EMU-based. Off-peak periods include early morning, midday, and after 7:00 p.m. After 2020, diesel locomotives would be replaced with EMUs over time as they reach the end of their service life. CalTrain's diesel-powered locomotives would continue to be used to provide service between the San Jose Diridon Station and Gilroy. It is expected that 100 percent of the San Jose to San Francisco fleet would be EMUs by 2026 to 2029.[6]

[3] Caltrain, 2014. *Peninsula Corridor Electrification Project. Final Environmental Impact Report*. December 2014.
[4] Caltrain, 2015. *Peninsula Corridor Electrification Fact Sheet*. May 2015.
[5] *Bay Area Regional Rail Plan, Technical Memorandum 4a, Conditions, Configuration & Traffic on Existing System*, Metropolitan Transportation Commission, November 15, 2006.
[6] Ibid

With CalTrain electrification, it was assumed that on an annual average basis during 2021 through 2025 there would be 19 daily train trips using diesel locomotives and that from 2025 on there would be two annual average daily trips with trains using diesel locomotives. All trains used for freight service were assumed to use diesel powered locomotives.

DPM and $PM_{2.5}$ emissions from trains on the rail line were calculated using EPA emission factors for locomotives[7] and CARB adjustment factors to account for fuels used in California[8]. CalTrain's current locomotive fleet consists of twenty-three 3,200 horsepower (hp) locomotives of model year or overhaul date of 1999 or earlier and six 3,600 hp locomotives of model year 2003.[9] The current fleet average locomotive engine size is about 3,285 hp. In estimating diesel exhaust emissions for 2021 and future years, the diesel locomotives that would still be operating were conservatively assumed to be the newer locomotives with the 3,600 hp engines.

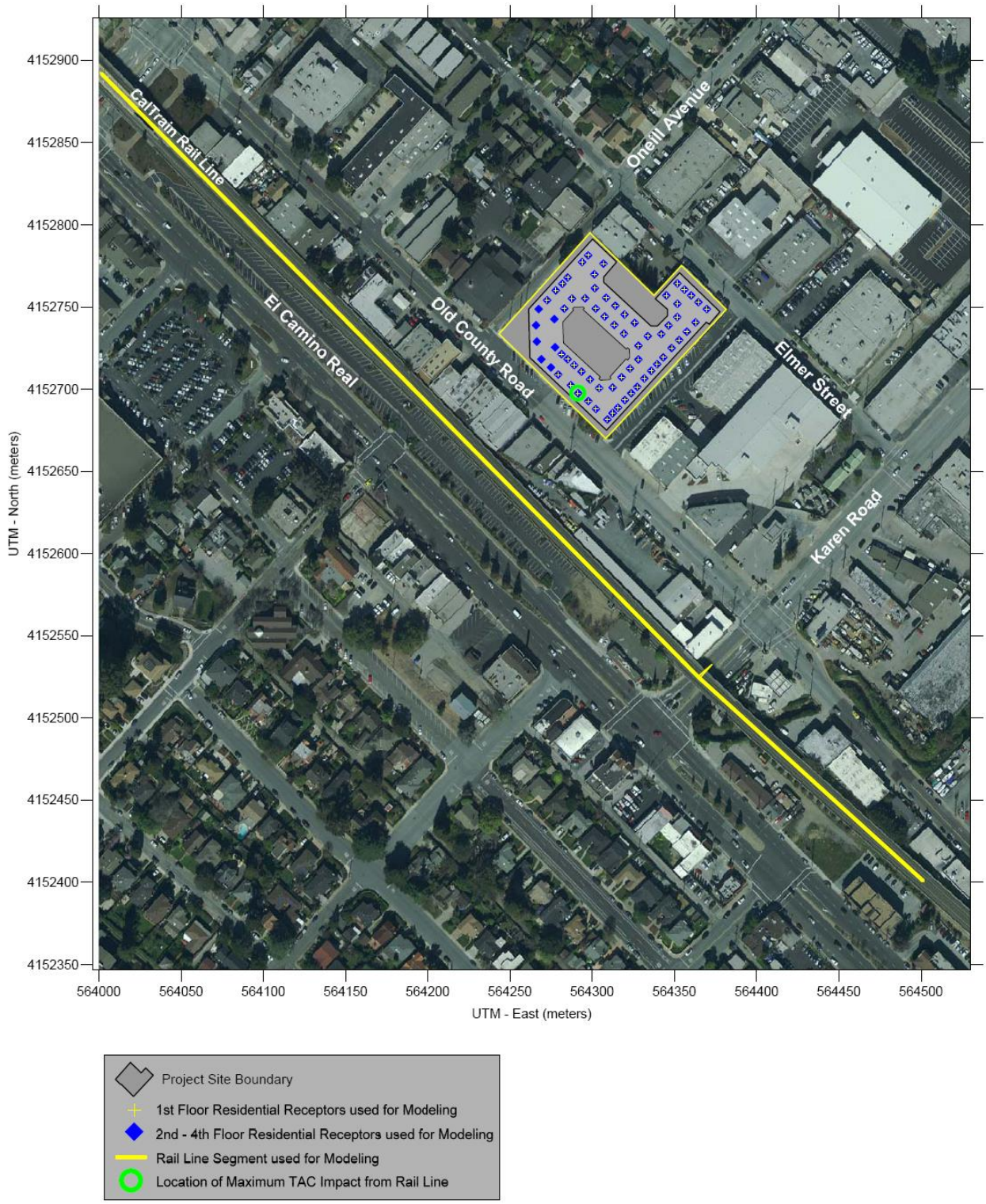
Each passenger train was assumed to use one locomotive and would be traveling at an average speed of 40 mph in the vicinity of the project site. Emissions from the freight trains were calculated assuming they would use two locomotives with 2,300 hp engines (total of 4,600 hp) and would be traveling at about 40 mph. Since the exposure duration used in calculating cancer risks is 30 years (in this case the period from 2021 through 2050), the CalTrain and freight train average DPM emissions were calculated for the periods 2021-2025 and 2026-2050 based on EPA emission factors.

Dispersion modeling of locomotive emissions was conducted using the EPA's AERMOD dispersion model and five-year data set (2009-2013) of hourly meteorological data from the San Carlos Airport prepared for use with the AERMOD model by CARB for use in modeling health risks. Locomotive emissions from train travel within about 1,000 feet of the project site were modeled as a line source comprised of a series of volume sources along the rail line. Impacts to future residents on the first through fourth floor levels were evaluated. Receptors for modeling were placed at each proposed residential unit on each floor level. Figure 2 shows the railroad segment used for the modeling and receptor locations where concentrations were calculated. The maximum modeled long-term DPM and $PM_{2.5}$ concentrations occurred at the second-floor level project receptors in the southwestern portion of the project site that are closest to the rail lines.

Based on the rail line modeling, the maximum annual $PM_{2.5}$ concentration from DPM emitted by trains was 0.01 $\mu g/m^3$. Increased cancer and non-cancer health risks were calculated using these model results and methods recommended by the BAAQMD, as described in *Attachment 1*. The maximum increased cancer risk was computed from this concentration as 4.8 in one million. The increased cancer risk would be below the BAAQMD significance threshold of a cancer risk greater than 10.0 in one million and would be considered a *less-than significant impact*. Potential non-cancer health effects due to chronic exposure to DPM were computed as a HI of 0.002. The location of maximum cancer risk is shown on Figure 2. Details of the emission calculations, dispersion modeling and cancer risk calculations are contained in *Attachment 2.*

[7] *Emission Factors for Locomotives*, USEPA 2009 (EPA-420-F-09-025)
[8] *Offroad Modeling, Change Technical Memo*, Changes to the Locomotive Inventory, CARB July 2006.
[9] Caltrain *Commute Fleets*. Available at: http://www.caltrain.com/about/statsandreports.html. Accessed March 4, 2016.

Figure 2. Project Site, On-site Residential Receptors, Rail Line Segments Evaluated, and Locations of Maximum Cancer Risk



IMPACTS FROM PROJECT CONSTRUCTION ACTIVITY

Construction activities, particularly during demolition, site preparation and grading would temporarily generate fugitive dust in the form of respirable particulate matter (PM_{10}) and $PM_{2.5}$. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if best management practices are employed to reduce these emissions. *Mitigation Measure AQ-4 of the DEIR would implement BAAQMD-required best management practices*.

Air Pollutant Emissions

The Construction activity is anticipated to include demolition, grading and site preparation, trenching, building construction, and paving. The construction schedule and equipment usage assumptions were estimated based on specific information provided for this project. The California Emissions Estimator Model (CalEEMod) Version 2016.3.2 was used to estimate emissions from construction and operation of the site assuming full build-out of the project. The project land use types and size, and anticipated construction schedule were input to CalEEMod. The model output from CalEEMod is included as *Attachment 3*. The proposed project land uses and construction information were input into CalEEMod were as follows:

- 250 Dwelling units entered as "Apartments Mid Rise"
- 259 Spaces entered as "Enclosed Parking with Elevator"
- Acreage = CalEEMod default of 6.58 acres
- Export fill = 40,800 cy
- Demolition = 29,000 sf and 15 tons pavement
- Building Construction Cement Hauling = 1464 one-way trips
- Paving Asphalt Hauling = 44 one-way trips

Construction of the project is expected to occur over about 19 months, beginning in 2019. Construction period emissions were modeled using CalEEMod along with the anticipated construction activity. The number and types of construction equipment and diesel vehicles, along with the anticipated length of their use for different phases of construction, were based on the model default conditions. A trenching phase was added. The CalEEMod modeling included emissions from truck and worker travel. For computation of air pollutants, the default travel lengths were used in the modeling. For the on-site health risk assessment, travel was assumed to occur over a distance of one mile on or near the site (note that travel away from the site would not contribute to health risk impacts).

The effect of the DEIR Mitigation Measure AQ-1, which requires Tier 4 construction equipment, was modeled in CalEEMod. The *Mitigated Construction* output includes the emissions for this effect (see *Attachment 4*). Note that this measure reduces diesel particulate matter emissions by over 90 percent. Best Management practices to control fugitive dust in the form of PM2.5, as required by the DEIR Mitigation Measure AQ-4, were also included in the modeling and shown in the *Mitigated Construction* output.

Construction TAC Assessment

The second part of this analysis involves a construction period TAC assessment (i.e., community risk assessment). Construction equipment and associated heavy-duty truck traffic generates diesel exhaust, which is a known TAC. These exhaust air pollutant emissions would not be considered to contribute substantially to existing or projected air quality violations. Construction exhaust emissions may still pose community risks for sensitive receptors such as nearby residents. The primary community risk impact issues associated with construction emissions are cancer risk and exposure to $PM_{2.5}$. Diesel exhaust poses both a potential health and nuisance impact to nearby receptors. A community risk assessment of the project construction activities was conducted that evaluated potential health effects of sensitive receptors at these nearby residences from construction emissions of DPM and $PM_{2.5}$.[10] The closest sensitive receptors to the project site would be residential units directly across Old County Road and residences opposite Oneill Avenue (refer to Figure 3). Emissions and dispersion modeling was conducted to predict the off-site DPM concentrations resulting from project construction, so that lifetime cancer risks and non-cancer health effects could be evaluated.

Construction TAC Emissions

The refined health risk assessment focused on modeling on-site construction activity using construction fleet information included in the project design features. Construction period emissions were modeled using CalEEMod, as previously described. The CalEEMod model provided total annual PM_{10} exhaust emissions (assumed to be diesel particulate matter) for the off-road construction equipment and for exhaust emissions from on-road vehicles (haul trucks, vendor trucks, and worker vehicles), with total emissions of 0.0157 tons (31 pounds). The on-road emissions are a result of haul truck travel, worker travel, and vendor deliveries during building demolition, grading and construction activities. A trip length of one mile was used to represent vehicle travel while at or near the construction site. It was assumed that these emissions from on-road vehicles traveling at or near the site would occur at the construction site. Fugitive $PM_{2.5}$ dust emissions were calculated by CalEEMod as 0.0233 tons (47 pounds) for the overall construction period.

Dispersion Modeling

The U.S. EPA AERMOD dispersion model was also used to predict concentrations of DPM and $PM_{2.5}$ concentrations at sensitive receptors (residences) that would be present in the vicinity of the project site during construction activities. Emission sources for the construction site were grouped into two categories: exhaust emissions of DPM and fugitive $PM_{2.5}$ dust emissions. The AERMOD modeling utilized four area sources to represent the on-site construction emissions, two for exhaust emissions and two for fugitive dust emissions. To represent the construction equipment exhaust emissions, an emission release height of 6 meters (19.7 feet) was used for the area source. The elevated source height reflects the height of the equipment exhaust pipes plus an additional distance for the height of the exhaust plume above the exhaust pipes to account for plume rise of the exhaust gases. For modeling fugitive $PM_{2.5}$ emissions, a near-ground level release height of 2 meters (6.6 feet) was used for the area source. Emissions from the

[10] DPM is identified by California as a toxic air contaminant due to the potential to cause cancer.

construction equipment and on-road vehicle travel were distributed throughout the modeled area sources. Construction emissions were modeled as occurring daily between 7 a.m. to 4 p.m., when the majority of construction activity would occur.

Dispersion modeling of construction emissions was conducted using the EPA's AERMOD dispersion model and a five-year data set (2009-2013) of hourly meteorological data from the San Carlos Airport prepared for use with the AERMOD model by CARB for use in modeling health risks. DPM and $PM_{2.5}$ concentrations from construction activities in 2019 and 2020 were calculated using the model. DPM and $PM_{2.5}$ concentrations were calculated at nearby residential locations at a receptor height of 1.5 meters (4.9 feet) and 4.5 meters (14.8 feet) to represent the first and second building levels of nearby multi-story apartments and other residences. Figure 3 shows the construction area and DPM area sources modeled and the locations of nearby residential receptors.

The maximum-modeled $PM_{2.5}$ and DPM concentrations occurred southwest of the project site at a ground level residential unit of an apartment building on Old County Road across from the site. The location where the maximum $PM_{2.5}$ and DPM concentrations occurred is identified on Figure 3 as the location of maximum TAC impact.

Health Impacts

The maximum increased lifetime cancer risk, annual $PM_{2.5}$ concentrations, and non-cancer hazard index for residents near the project site from construction activities were computed using modeled DPM and $PM_{2.5}$ concentrations and the health risk calculation methods and exposure parameters described in *Attachment 1*. The cancer risk calculations are based on applying the BAAQMD recommended age sensitivity factors to the TAC concentrations. Age-sensitivity factors reflect the greater sensitivity of infants and small children to cancer causing TACs. BAAQMD-recommended exposure parameters were used for the cancer risk calculations. Results of this assessment are shown in Table 3. *Attachment 4* includes the modeling information.

The contribution of cumulative sources within 1,000 feet of the project site were also assessed in the same manner that they were for the proposed project site. This included use of BAAQMD screening data and distance multipliers for roadways and stationary sources. Modeling of CalTrain was conducted. Since community risk levels for single and combined (or cumulative) sources are below the significance thresholds, the impact would be considered less-than-significant.

Figure 3. Project Construction Site, Modeled Receptors and Location of Maximum Impact from Project

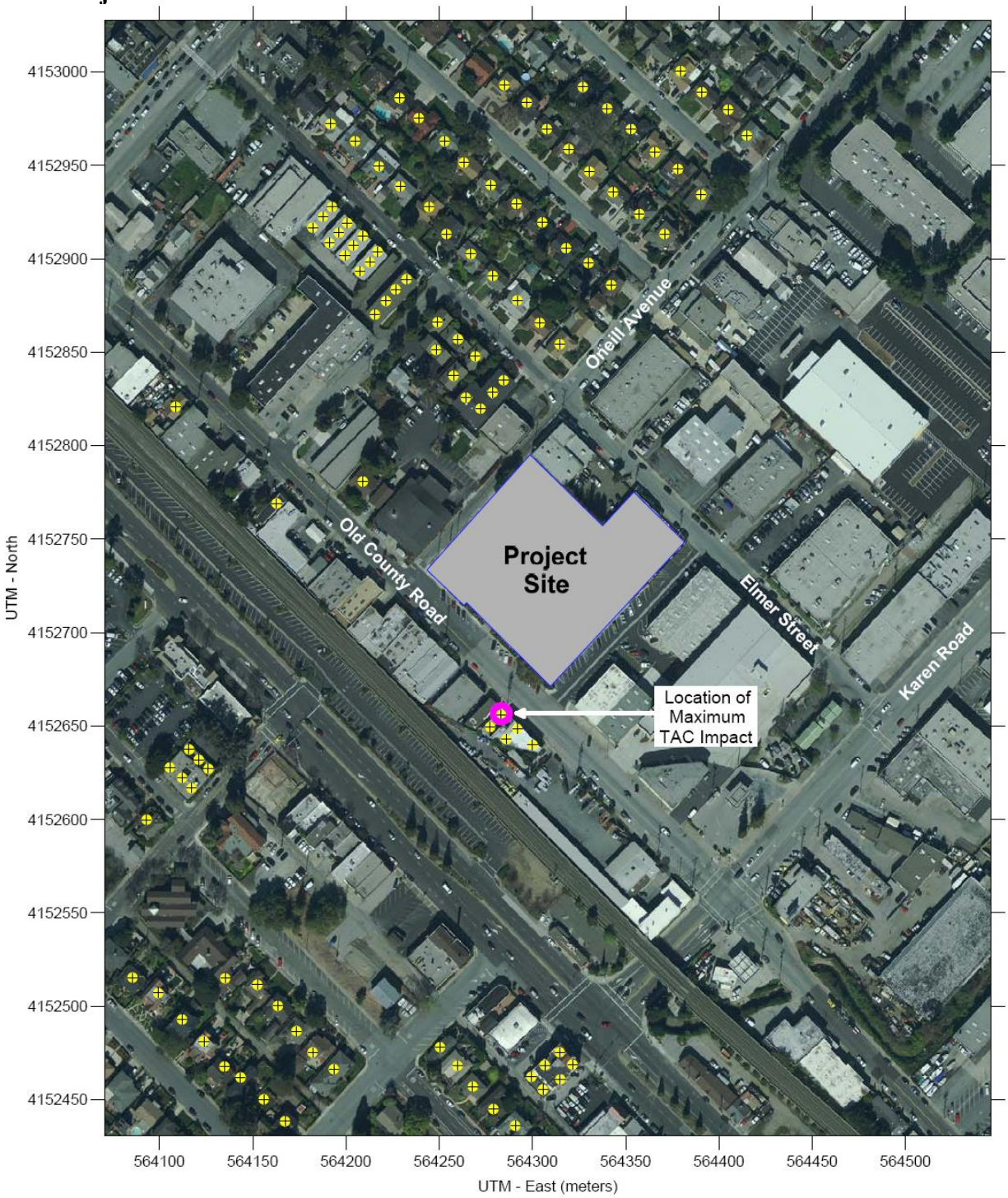


Table 3. Community Risk Impacts from Project Construction and Cumulative Sources

Source	Maximum Cancer Risk (per million)	Maximum Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)	Maximum Hazard Index
Project Construction	**7.7 (infant exp.)**	**0.12**	**0.01**
El Camino Real – Link 26 (6ft elevation) – 200 feet east	8.6	0.09	0.01
Plant #111993 (Gas Station) at 700 feet	1.0	N/A	<0.01
Plant #15882 (Generator) at 810 feet	<0.1	<0.01	<0.01
Plant #110968 Gas Station) at 350 feet	0.6	N/A	<0.01
Plant #112510 Gas Station) at 560 feet	1.0	N/A	0.01
CalTrain with electrification – 100 ft east	6.8	0.01	<0.01
Cumulative Total	<25.8	0.23	0.06
BAAQMD Threshold – Single/ Cumulative Sources	***>10.0/100***	***>0.3/0.8***	***>1.0/10.0***
Exceed Threshold?	***No***	***No***	***No***

Supporting Documentation

Attachment 1 is the methodology used to compute community risk impacts, including the methods to compute lifetime cancer risk from exposure to project emissions.

Attachment 2 includes the screening community risk calculations from sources affecting the project and MEI and the CalTrain health risk modeling.

Attachment 3 includes the CalEEMod output for project construction. Also included are any modeling assumptions.

Attachment 4 is the construction health risk assessment. AERMOD dispersion modeling files for this assessment, which are quite voluminous, are available upon request and would be provided in digital format.

Attachment 1: Health Risk Calculation Methodology

A health risk assessment (HRA) for exposure to Toxic Air Contaminates (TACs) requires the application of a risk characterization model to the results from the air dispersion model to estimate potential health risk at each sensitive receptor location. The State of California Office of Environmental Health Hazard Assessment (OEHHA) and California Air Resources Board (CARB) develop recommended methods for conducting health risk assessments. The most recent OEHHA risk assessment guidelines were published in February of 2015.[11] These guidelines incorporate substantial changes designed to provide for enhanced protection of children, as required by State law, compared to previous published risk assessment guidelines. CARB has provided additional guidance on implementing OEHHA's recommended methods.[12] This HRA used the recent 2015 OEHHA risk assessment guidelines and CARB guidance. The BAAQMD has adopted recommended procedures for applying the newest OEHHA guidelines as part of Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.[13] Exposure parameters from the OEHHA guidelines and the recent BAAQMD HRA Guidelines were used in this evaluation.

Cancer Risk

Potential increased cancer risk from inhalation of TACs are calculated based on the TAC concentration over the period of exposure, inhalation dose, the TAC cancer potency factor, and an age sensitivity factor to reflect the greater sensitivity of infants and children to cancer causing TACs. The inhalation dose depends on a person's breathing rate, exposure time and frequency of exposure, and the exposure duration. These parameters vary depending on the age, or age range, of the persons being exposed and whether the exposure is considered to occur at a residential location or other sensitive receptor location.

The current OEHHA guidance recommends that cancer risk be calculated by age groups to account for different breathing rates and sensitivity to TACs. Specifically, they recommend evaluating risks for the third trimester of pregnancy to age zero, ages zero to less than two (infant exposure), ages two to less than 16 (child exposure), and ages 16 to 70 (adult exposure). Age sensitivity factors (ASFs) associated with the different types of exposure are an ASF of 10 for the third trimester and infant exposures, an ASF of 3 for a child exposure, and an ASF of 1 for an adult exposure. Also associated with each exposure type are different breathing rates, expressed as liters per kilogram of body weight per day (L/kg-day). As recommended by the BAAQMD, 95th percentile breathing rates are used for the third trimester and infant exposures, and 80th percentile breathing rates for child and adult exposures. Additionally, CARB and the BAAQMD recommend the use of a residential exposure duration of 30 years for sources with long-term emissions (e.g., roadways).

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[11] OEHHA, 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*. Office of Environmental Health Hazard Assessment. February.

[12] CARB, 2015. *Risk Management Guidance for Stationary Sources of Air Toxics*. July 23.

[13] BAAQMD, 2016. *BAAQMD Air Toxics NSR Program Health Risk Assessment (HRA) Guidelines*. December 2016.

Under previous OEHHA and BAAQMD HRA guidance, residential receptors are assumed to be at their home 24 hours a day, or 100 percent of the time. In the 2015 Risk Assessment Guidance, OEHHA includes adjustments to exposure duration to account for the fraction of time at home (FAH), which can be less than 100 percent of the time, based on updated population and activity statistics. The FAH factors are age-specific and are: 0.85 for third trimester of pregnancy to less than 2 years old, 0.72 for ages 2 to less than 16 years, and 0.73 for ages 16 to 70 years. Use of the FAH factors is allowed by the BAAQMD if there are no schools in the project vicinity that would have a cancer risk of one in a million or greater assuming 100 percent exposure (FAH = 1.0).

Functionally, cancer risk is calculated using the following parameters and formulas:

Cancer Risk (per million) = $CPF \times Inhalation\ Dose \times ASF \times ED/AT \times FAH \times 10^6$

Where:

CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = $C_{air} \times DBR \times A \times (EF/365) \times 10^{-6}$

Where:

C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

The health risk parameters used in this evaluation are summarized as follows:

Parameter	*Exposure Type* →	Infant		Child		Adult
	Age Range →	3rd Trimester	0<2	2 < 9	2 < 16	16 - 30
DPM Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$		1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
Daily Breathing Rate (L/kg-day)*		361	1,090	631	572	261
Inhalation Absorption Factor		1	1	1	1	1
Averaging Time (years)		70	70	70	70	70
Exposure Duration (years)		0.25	2	14	14	14
Exposure Frequency (days/year)		350	350	350	350	350
Age Sensitivity Factor		10	10	3	3	1
Fraction of Time at Home		0.85-1.0	0.85-1.0	0.72-1.0	0.72-1.0	0.73

* 95th percentile breathing rates for 3rd trimester and infants and 80th percentile for children and adults

Non-Cancer Hazards

Potential non-cancer health hazards from TAC exposure are expressed in terms of a hazard index (HI), which is the ratio of the TAC concentration to a reference exposure level (REL). OEHHA has defined acceptable concentration levels for contaminants that pose non-cancer health hazards. TAC concentrations below the REL are not expected to cause adverse health impacts, even for sensitive individuals. The total HI is calculated as the sum of the HIs for each TAC evaluated and the total HI is compared to the BAAQMD significance thresholds to determine whether a significant non-cancer health impact from a project would occur.

Typically, for residential projects located near roadways with substantial TAC emissions, the primary TAC of concern with non-cancer health effects is diesel particulate matter (DPM). For DPM, the chronic inhalation REL is 5 micrograms per cubic meter ($\mu g/m^3$).

Annual $PM_{2.5}$ Concentrations

While not a TAC, fine particulate matter ($PM_{2.5}$) has been identified by the BAAQMD as a pollutant with potential non-cancer health effects that should be included when evaluating potential community health impacts under the California Environmental Quality Act (CEQA). The thresholds of significance for $PM_{2.5}$ (project level and cumulative) are in terms of an increase in the annual average concentration. When considering $PM_{2.5}$ impacts, the contribution from all sources of $PM_{2.5}$ emissions should be included. For projects with potential impacts from nearby local roadways, the $PM_{2.5}$ impacts should include those from vehicle exhaust emissions, $PM_{2.5}$ generated from vehicle tire and brake wear, and fugitive emissions from re-suspended dust on the roads.

Attachment 2: Stationary Source and CalTrain Health Risk Modeling

Bay Area Air Quality Management District

Risk & Hazard Stationary Source Inquiry Form

This form is required when users request stationary source data from BAAQMD

This form is to be used with the BAAQMD's Google Earth stationary source screening tables.

Click here for guidance on coducting risk & hazard screening, including roadways & freeways, refer to the District's Risk & Hazard Analysis flow chart.

Click here for District's Recommended Methods for Screening and Modeling Local Risks and Hazards document.

Table A: Requester Contact Information

Date of Request	**9/12/2018**
Contact Name	Casey Zaglin
Affiliation	Illingworth & Rodkin, Inc.
Phone	707-794-0400 x23
Email	czaglin@illingworthrodkin.com
Project Name	17-224 Artisan Crossing
Address	1325 Old County Road
City	Belmont
County	San Mateo
Type (residential, commercial, mixed use, industrial, etc.)	Residential
Project Size (# of units or building square feet)	250 du
Comments:	

For Air District assistance, the following steps must be completed:

1. Complete all the contact and project information requested in Table A incomplete forms will not be processed. Please include a project site map.

2. Download and install the free program Google Earth, **http://www.google.com/earth/download/ge/,** and then download the county specific Google Earth stationary source application files from the District's website, **http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.** The small points on the map represent stationary sources permitted by the District (Map A on right). These permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc. Click on a point to view the source's Information Table, including the name, location, and preliminary estimated cancer risk, hazard index, and PM2.5 concentration.

3. Find the project site in Google Earth by inputting the site's address in the Google Earth search box.

4. Identify stationary sources within at least a 1000ft radius of project site. Verify that the location of the source on the map matches with the source's address in the Information Table, by using the Google Earth address search box to confirm the source's address location. Please report any mapping errors to the District.

5. List the stationary source information in Table B section only.

6. Note that a small percentage of the stationary sources have Health Risk Screening Assessment (HRSA) data INSTEAD of screening level data. These sources will be noted by an asterisk next to the Plant Name (Map B on right). If HRSA values are presented, these values have already been modeled and cannot be adjusted further.

7. Email this completed form to District staff. District staff will provide the most recent risk, hazard, and PM2.5 data that are available for the source(s). If this information or data are not available, source emissions data will be provided. Staff will respond to inquiries within three weeks.

Note that a public records request received for the same stationary source information will cancel the processing of your SSIF request.

Submit forms, maps, and questions to Areana Flores at 415-749-4616, or aflores@baaqmd.gov

Table B: Google Earth data

Distance from Receptor (feet) or MEI[1]	Facility Name	Address	Plant No.	Cancer Risk[2]	Hazard Risk[2]	$PM_{2.5}$[2]	Source No.[3]	Type of Source[4]	Fuel Code[5]	Status/Comments
700	G & G Greco #254519	699 Ralston Avenue	111993	61.800	0.305	na	S1	GDF		
810	County of San Mateo	400 Harbor Blvd, Bldg C	15882	1.165	0.002	0.001	S1	Generator	98	
350	Peninsula Cardlock	610 Harbor Blvd	110968	7.943	0.039	na	S1	GDF		
560	Belmont Kwik Serv	701 Harbor Blvd	112510	27.368	0.135	na	S1	GDF		

Project Site

Distance Adjustment Multiplier	Adjusted Cancer Risk Estimate	Adjusted Hazard Risk	Adjusted PM2.5
0.03	1.6	0.01	#VALUE!
0.06	0.1	0.00	0.00
0.08	0.6	0.00	#VALUE!
0.04	1.0	0.01	#VALUE!

Footnotes:

1. Maximally exposed individual

Construction MEI

Distance from Receptor (feet) or MEI[1]	Distance Adjustment Multiplier	Adjusted Cancer Risk Estimate	Adjusted Hazard Risk	Adjusted PM2.5
950	0.02	1.0	0.00	#VALUE!
1000	0.04	0.0	0.00	0.00
350	0.08	0.6	0.00	#VALUE!
515	0.04	1.2	0.01	#VALUE!

2. These Cancer Risk, Hazard Index, and PM2.5 columns represent the values in the Google Earth Plant Information Table.
3. Each plant may have multiple permits and sources.
4. Permitted sources include diesel back-up generators, gas stations, dry cleaners, boilers, printers, auto spray booths, etc.
5. Fuel codes: 98 = diesel, 189 = Natural Gas.
6. If a Health Risk Screening Assessment (HRSA) was completed for the source, the application number will be listed here.
7. The date that the HRSA was completed.
8. Engineer who completed the HRSA. For District purposes only.
9. All HRSA completed before 1/5/2010 need to be multiplied by an age sensitivity factor of 1.7.
10. The HRSA "Chronic Health" number represents the Hazard Index.
11. Further information about common sources:
    a. Sources that only include diesel internal combustion engines can be adjusted using the BAAQMD's Diesel Multiplier worksheet.
    b. The risk from natural gas boilers used for space heating when <25 MM BTU/hr would have an estimated cancer risk of one in a million or less, and a chronic hazard index
    c. BAAQMD Reg 11 Rule 16 required that all co-residential (sharing a wall, floor, ceiling or is in the same building as a residential unit) dry cleaners cease use of perc on July 1, 2010. Therefore, there is no cancer risk, hazard or PM2.5 concentrations from co-residential dry cleaning businesses in the BAAQMD.
    d. Non co-residential dry cleaners must phase out use of perc by Jan. 1, 2023. Therefore, the risk from these dry cleaners does not need to be factored in over a 70-year period, but
    e. Gas stations can be adjusted using BAAQMD's Gas Station Distance Mulitplier worksheet.
    f. Unless otherwise noted, exempt sources are considered insignificant. See BAAQMD Reg 2 Rule 1 for a list of exempt sources.
    g. This spray booth is considered to be insignificant.

Date last updated:

CalTrain Health Risk Modeling

Artisan Crossing, Belmont, CA
DPM Modeling - Rail Line Information and DPM and PM2.5 Emission Rates
Caltrain Electrification and Diesel-Powered Freight Trains

Year	Description	No. Lines Modeled	Segment Width (ft)	Segment Width (m)	Segment Length (ft)	Segment Length (miles)	Segment Length (m)	Release Height (m)	Average No. Trains per Day	Train Travel Speed (mph)	DPM Emission Rates			
											Average Daily Emission Rate (g/mi/day)	Average Daily Emission Rate (g/day)	Link Emission Rate (g/s)	Link Emission Rate (lb/hr)
2021-2025	Caltrain	1	12	3.7	2,299	0.44	701	5.0	19	40	48.5	21.1	2.44E-04	1.94E-03
	Freight Trains	1	12	3.7	2,299	0.44	701	5.0	4	40	17.5	7.6	8.80E-05	6.99E-04
	Total	-	-	-	-	-	-	-	**23**	-	**65.9**	**28.7**	**3.32E-04**	**2.64E-03**
2026-2050	Caltrain	1	12	3.7	2,299	0.44	701	5.0	3	40	2.3	1.0	1.15E-05	9.16E-05
	Freight Trains	1	12	3.7	2,299	0.44	701	5.0	4	40	6.3	2.8	3.18E-05	2.53E-04
	Total	-	-	-	-	-	-	-	**7**	-	**8.6**	**3.7**	**4.34E-05**	**3.44E-04**

Notes: Emission based on Emission Factors for Locomotives, USEPA 2009 (EPA-420-F-09-025)
Average emissions calculated for 2021-2025 & 2026-2049 periods.
Fuel correction factors from Offroad Modeling Change Technical memo, Changes to the Locomotive Inventory, CARB July 2006.
PM2.5 calculated as 92% of PM emissions (CARB CEIDERS PM2.5 fractions)
Passenger trains assumed to operate for 24 hours per day
Freight trains assumed to operate for 24 hours per day

Number of Diesel Trains in Service			
Trains on Rail Line	**2021 - 2025**	**2026 - 2049**	
Caltrain Diesel Trains	***Total***	***Total***	
Passenger trains - weekday =	24	4	
Passenger trains - weekend =	4	0	
Passenger trains - Sat only =	4	0	
Total Trains =	32	4	
Annual average daily trains =	19	3	
Locomotive horsepower =	3600	3600	(2021 and later)
Locomotive engine load =	0.5	0.5	
Freight	***Total***	***Total***	
Freight trains per day =	4	4	
Locomotive horsepower =	2300	2300	
Locomotives per train =	2	2	
Total horsepower =	4600	4600	
Locomotive engine load =	0.5	0.5	

Locomotive DPM Emission Factors (g/hp-hr)

Train Type	2021-2025	2026-2049
Passenger	0.0808	0.025
Freight	0.0904	0.033

* average emissions for period.

PM2.5 to PM ratio = 0.92
DPM to PM ratio = 1

	CARB Fuel Adj Factor	
	2010	2011+
Passenger	0.717	0.709
Freight	0.851	0.840

Artisan Crossing - 1st Floor - Rail Line DPM & PM2.5 Concentrations
AERMOD Risk Modeling Parameters and Maximum Concentrations
Caltrain Electrification and Diesel-Powered Freight Trains

Receptor Information	1st Floor Receptors
Number of Receptors	62
Receptor Height =	2.72 meters (8.9 feet)
Receptor distances =	receptors placed at proposed residential units

Meteorological Conditions

CARB San Carlos Airport Hourly Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

MEI Maximum Concentrations - Receptor Height = 2.72 m

Meteorological Data Years	**Period Average DPM Concentration ($\mu g/m^3$) 2021-2025**	**2026-2050**
2009-2013	0.0097	0.00127
Meteorological Data Years	**2021-2025**	**2026-2050**
2009-2013	0.0090	0.0012

Artisan Crossing - 2nd Floor - Rail Line DPM & PM2.5 Concentrations
AERMOD Risk Modeling Parameters and Maximum Concentrations
Caltrain Electrification and Diesel-Powered Freight Trains

Receptor Information	2nd Floor Receptors
Number of Receptors	69
Receptor Height =	5.77 meters (18.9 feet)
Receptor distances =	receptors placed at proposed residential units

Meteorological Conditions

CARB San Carlos Airport Hourly Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

MEI Maximum Concentrations - Receptor Height = 5.77 m

Meteorological Data Years	**Period Average DPM Concentration ($\mu g/m^3$) 2021-2025**	**2026-2050**
2009-2013	0.0104	0.00136
Meteorological Data Years	**2021-2025**	**2026-2050**
2009-2013	0.0095	0.0013

Artisan Crossing - 3rd Floor - Rail Line DPM & PM2.5 Concentrations
AERMOD Risk Modeling Parameters and Maximum Concentrations
Caltrain Electrification and Diesel-Powered Freight Trains

Receptor Information	3rd Floor Receptors
Number of Receptors	69
Receptor Height =	8.82 meters (28.9 feet)
Receptor distances =	receptors placed at proposed residential units

Meteorological Conditions

CARB San Carlos Airport Hourly Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

MEI Maximum Concentrations - Receptor Height = 8.82 m

Meteorological Data Years	Period Average DPM Concentration ($\mu g/m^3$)	
	2021-2025	**2026-2050**
2009-2013	0.0094	0.00123
Meteorological Data Years	**2021-2025**	**2026-2050**
2009-2013	0.0087	0.0011

Artisan Crossing - Construction MEI Location - Rail Line DPM & PM2.5 Concentrations
AERMOD Risk Modeling Parameters and Maximum Concentrations
Caltrain Electrification and Diesel-Powered Freight Trains

Receptor Information	Construction MEI Location
Number of Receptors	1
Receptor Height =	1.5 meters
Receptor distances =	MEI Location

Meteorological Conditions

CARB San Carlos Airport Hourly Data	2009-2013
Land Use Classification	urban
Wind speed =	variable
Wind direction =	variable

MEI Maximum Concentrations - Receptor Height = 1.5 m

Meteorological Data Years	Period Average DPM Concentration ($\mu g/m^3$)	
	2021-2025	**2026-2050**
2009-2013	0.0148	0.00193
Meteorological Data Years	**2021-2025**	**2026-2050**
2009-2013	0.0136	0.0018

Artisan Crossing - 1st Floor Receptors (2.7 meter receptor height)
AERMOD Railroad DPM Risk Modeling - Maximum Cancer Risk at Project Site
Caltrain Electrification and Diesel-Powered Freight Trains

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

Cancer Potency Factors $(mg/kg\text{-}day)^{-1}$

TAC	CPF
DPM	1.10E+00

	Infant/Child			Adult
Age -->	3rd Trimester	0 - <2	2 - <16	16 - 30
Parameter				
ASF	10	10	3	1
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
ED =	0.25	2	14	14
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Rail Locomotive Cancer Risk by Year - Maximum Impact Receptor Location

Exposure Year	Year	Exposure Duration (years)	Age	Age Sensitivity Factor	DPM Annual Conc (ug/m3)	DPM Cancer Risk (per million)
0	2021	0.25	-0.25 - 0*	10	0.0097	0.132
1	2021	1	1	10	0.0097	1.598
2	2022	1	2	10	0.0097	1.598
3	2023	1	3	3	0.0097	0.252
4	2024	1	4	3	0.0097	0.252
5	2025	1	5	3	0.0097	0.252
6	2026	1	6	3	0.0013	0.033
7	2027	1	7	3	0.0013	0.033
8	2028	1	8	3	0.0013	0.033
9	2029	1	9	3	0.0013	0.033
10	2030	1	10	3	0.0013	0.033
11	2031	1	11	3	0.0013	0.033
12	2032	1	12	3	0.0013	0.033
13	2033	1	13	3	0.0013	0.033
14	2034	1	14	3	0.0013	0.033
15	2035	1	15	3	0.0013	0.033
16	2036	1	16	3	0.0013	0.033
17	2037	1	17	1	0.0013	0.004
18	2038	1	18	1	0.0013	0.004
19	2039	1	19	1	0.0013	0.004
20	2040	1	20	1	0.0013	0.004
21	2041	1	21	1	0.0013	0.004
22	2042	1	22	1	0.0013	0.004
23	2043	1	23	1	0.0013	0.004
24	2044	1	24	1	0.0013	0.004
25	2045	1	25	1	0.0013	0.004
26	2046	1	26	1	0.0013	0.004
27	2047	1	27	1	0.0013	0.004
28	2048	1	28	1	0.0013	0.004
29	2049	1	29	1	0.0013	0.004
30	2050	1	30	1	0.0013	0.004
Total Increased Cancer Risk						**4.5**

* Third trimester of pregnancy

Artisan Crossing - 2nd Floor Receptors 5.77 meter receptor height)
AERMOD Railroad DPM Risk Modeling - Maximum Cancer Risk at Project Site
Caltrain Electrification and Diesel-Powered Freight Trains

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

Cancer Potency Factors $(mg/kg\text{-}day)^{-1}$

TAC	CPF
DPM	1.10E+00

	Infant/Child			Adult
Age -->	3rd Trimester	0 - <2	2 - <16	16 - 30
Parameter				
ASF	10	10	3	1
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
ED =	0.25	2	14	14
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Rail Locomotive Cancer Risk by Year - Maximum Impact Receptor Location

Exposure Year	Year	Exposure Duration (years)	Age	Age Sensitivity Factor	DPM Annual Conc (ug/m3)	DPM Cancer Risk (per million)
0	2021	0.25	-0.25 - 0*	10	0.0104	0.141
1	2021	1	1	10	0.0104	1.703
2	2022	1	2	10	0.0104	1.703
3	2023	1	3	3	0.0104	0.268
4	2024	1	4	3	0.0104	0.268
5	2025	1	5	3	0.0104	0.268
6	2026	1	6	3	0.0014	0.035
7	2027	1	7	3	0.0014	0.035
8	2028	1	8	3	0.0014	0.035
9	2029	1	9	3	0.0014	0.035
10	2030	1	10	3	0.0014	0.035
11	2031	1	11	3	0.0014	0.035
12	2032	1	12	3	0.0014	0.035
13	2033	1	13	3	0.0014	0.035
14	2034	1	14	3	0.0014	0.035
15	2035	1	15	3	0.0014	0.035
16	2036	1	16	3	0.0014	0.035
17	2037	1	17	1	0.0014	0.004
18	2038	1	18	1	0.0014	0.004
19	2039	1	19	1	0.0014	0.004
20	2040	1	20	1	0.0014	0.004
21	2041	1	21	1	0.0014	0.004
22	2042	1	22	1	0.0014	0.004
23	2043	1	23	1	0.0014	0.004
24	2044	1	24	1	0.0014	0.004
25	2045	1	25	1	0.0014	0.004
26	2046	1	26	1	0.0014	0.004
27	2047	1	27	1	0.0014	0.004
28	2048	1	28	1	0.0014	0.004
29	2049	1	29	1	0.0014	0.004
30	2050	1	30	1	0.0014	0.004
Total Increased Cancer Risk						**4.8**

* Third trimester of pregnancy

Artisan Crossing - 3rd Floor Receptors 8.82 meter receptor height)
AERMOD Railroad DPM Risk Modeling - Maximum Cancer Risk at Project Site
Caltrain Electrification and Diesel-Powered Freight Trains

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

Cancer Potency Factors $(mg/kg\text{-}day)^{-1}$

TAC	CPF
DPM	1.10E+00

	Infant/Child			Adult
Age -->	3rd Trimester	0 - <2	2 - <16	16 - 30
Parameter				
ASF	10	10	3	1
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
ED =	0.25	2	14	14
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Rail Locomotive Cancer Risk by Year - Maximum Impact Receptor Location

Exposure Year	Year	Exposure Duration (years)	Age	Age Sensitivity Factor	DPM Annual Conc (ug/m3)	DPM Cancer Risk (per million)
0	2021	0.25	-0.25 - 0*	10	0.0094	0.128
1	2021	1	1	10	0.0094	1.549
2	2022	1	2	10	0.0094	1.549
3	2023	1	3	3	0.0094	0.244
4	2024	1	4	3	0.0094	0.244
5	2025	1	5	3	0.0094	0.244
6	2026	1	6	3	0.0012	0.032
7	2027	1	7	3	0.0012	0.032
8	2028	1	8	3	0.0012	0.032
9	2029	1	9	3	0.0012	0.032
10	2030	1	10	3	0.0012	0.032
11	2031	1	11	3	0.0012	0.032
12	2032	1	12	3	0.0012	0.032
13	2033	1	13	3	0.0012	0.032
14	2034	1	14	3	0.0012	0.032
15	2035	1	15	3	0.0012	0.032
16	2036	1	16	3	0.0012	0.032
17	2037	1	17	1	0.0012	0.004
18	2038	1	18	1	0.0012	0.004
19	2039	1	19	1	0.0012	0.004
20	2040	1	20	1	0.0012	0.004
21	2041	1	21	1	0.0012	0.004
22	2042	1	22	1	0.0012	0.004
23	2043	1	23	1	0.0012	0.004
24	2044	1	24	1	0.0012	0.004
25	2045	1	25	1	0.0012	0.004
26	2046	1	26	1	0.0012	0.004
27	2047	1	27	1	0.0012	0.004
28	2048	1	28	1	0.0012	0.004
29	2049	1	29	1	0.0012	0.004
30	2050	1	30	1	0.0012	0.004
Total Increased Cancer Risk						**4.4**

* Third trimester of pregnancy

Artisan Crossing - Construction MEI Location 1.5 meter receptor height)
AERMOD Railroad DPM Risk Modeling - Maximum Cancer Risk at Construction MEI
Caltrain Electrification and Diesel-Powered Freight Trains

Cancer Risk Calculation Method

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

Cancer Potency Factors $(mg/kg\text{-}day)^{-1}$

TAC	CPF
DPM	1.10E+00

	Infant/Child			Adult
Age -->	3rd Trimester	0 - <2	2 - <16	16 - 30
Parameter				
ASF	10	10	3	1
DBR* =	361	1090	572	261
A =	1	1	1	1
EF =	350	350	350	350
ED =	0.25	2	14	14
AT =	70	70	70	70
FAH =	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Rail Locomotive Cancer Risk by Year - Maximum Impact Receptor Location

Exposure Year	Year	Exposure Duration (years)	Age	Age Sensitivity Factor	DPM Annual Conc (ug/m3)	DPM Cancer Risk (per million)
0	2021	0.25	-0.25 - 0*	10	0.0148	0.201
1	2021	1	1	10	0.0148	2.426
2	2022	1	2	10	0.0148	2.426
3	2023	1	3	3	0.0148	0.382
4	2024	1	4	3	0.0148	0.382
5	2025	1	5	3	0.0148	0.382
6	2026	1	6	3	0.0019	0.050
7	2027	1	7	3	0.0019	0.050
8	2028	1	8	3	0.0019	0.050
9	2029	1	9	3	0.0019	0.050
10	2030	1	10	3	0.0019	0.050
11	2031	1	11	3	0.0019	0.050
12	2032	1	12	3	0.0019	0.050
13	2033	1	13	3	0.0019	0.050
14	2034	1	14	3	0.0019	0.050
15	2035	1	15	3	0.0019	0.050
16	2036	1	16	3	0.0019	0.050
17	2037	1	17	1	0.0019	0.006
18	2038	1	18	1	0.0019	0.006
19	2039	1	19	1	0.0019	0.006
20	2040	1	20	1	0.0019	0.006
21	2041	1	21	1	0.0019	0.006
22	2042	1	22	1	0.0019	0.006
23	2043	1	23	1	0.0019	0.006
24	2044	1	24	1	0.0019	0.006
25	2045	1	25	1	0.0019	0.006
26	2046	1	26	1	0.0019	0.006
27	2047	1	27	1	0.0019	0.006
28	2048	1	28	1	0.0019	0.006
29	2049	1	29	1	0.0019	0.006
30	2050	1	30	1	0.0019	0.006
Total Increased Cancer Risk						**6.8**

* Third trimester of pregnancy

Attachment 3: CalEEMod Modeling Output

Artisan Crossing, 1325 OldCounty Rd Belmont

San Mateo County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Enclosed Parking with Elevator	259.00	Space	0.00	84,990.00	0
Apartments Mid Rise	250.00	Dwelling Unit	6.58	224,228.00	628

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	70
Climate Zone	5			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PG&E Rate

Land Use - Based on US Dept of Finance 2.51 pphh = 628, default acerage used to account for below ground garage

Construction Phase - added trenching - overlap phase, applicant provided schedule

Off-road Equipment - Applicant provded equipment & hours

Off-road Equipment - Applicant provded equipment & hours

Off-road Equipment - Applicant provded equipment & hours

Off-road Equipment - Applicant provded equipment & hours

Off-road Equipment - Applicant provded equipment & hours

Off-road Equipment - Applicant provded equipment & hours

Off-road Equipment - Applicant provded equipment & hours

Trips and VMT - Pavement at 15 tons or 6 trips, cement = 1464 trips, asphalt 44 trips. Just on- and near-site travel 1 Mile trips

Demolition - appicant provided 29,000sf demo

Grading - applicant provided export 40,800cy

Vehicle Trips -

Woodstoves - No wood burning, assume all natural gas = 80

Construction Off-road Equipment Mitigation - BMPs, Tier 4 interim

Energy Use -

Water And Wastewater - WTP treatment

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	9.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim

tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstructionPhase	NumDays	20.00	28.00
tblConstructionPhase	NumDays	230.00	300.00
tblConstructionPhase	NumDays	20.00	30.00
tblConstructionPhase	NumDays	20.00	25.00
tblConstructionPhase	NumDays	10.00	8.00
tblConstructionPhase	PhaseEndDate	3/23/2020	7/29/2020
tblConstructionPhase	PhaseEndDate	1/27/2020	5/14/2020
tblConstructionPhase	PhaseEndDate	1/28/2019	2/11/2019
tblConstructionPhase	PhaseEndDate	3/11/2019	3/21/2019
tblConstructionPhase	PhaseEndDate	2/24/2020	6/18/2020
tblConstructionPhase	PhaseEndDate	2/11/2019	2/21/2019
tblConstructionPhase	PhaseStartDate	2/25/2020	6/20/2020
tblConstructionPhase	PhaseStartDate	3/12/2019	3/22/2019
tblConstructionPhase	PhaseStartDate	2/12/2019	2/22/2019
tblConstructionPhase	PhaseStartDate	1/28/2020	5/15/2020
tblConstructionPhase	PhaseStartDate	1/29/2019	2/12/2019
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	37.50	80.00

tblFireplaces	NumberWood	42.50	0.00
tblGrading	MaterialExported	0.00	40,800.00
tblLandUse	LandUseSquareFeet	103,600.00	84,990.00
tblLandUse	LandUseSquareFeet	250,000.00	224,228.00
tblLandUse	LotAcreage	2.33	0.00
tblLandUse	Population	715.00	628.00
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.38	0.38
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Cement and Mortar Mixers
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Aerial Lifts
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	2.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripLength	20.00	1.00
tblTripsAndVMT	HaulingTripNumber	132.00	138.00
tblTripsAndVMT	HaulingTripNumber	0.00	1,464.00

tblTripsAndVMT	HaulingTripNumber	0.00	44.00
tblTripsAndVMT	VendorTripLength	7.30	1.00
tblTripsAndVMT	VendorTripLength	7.30	1.00
tblTripsAndVMT	VendorTripLength	7.30	1.00
tblTripsAndVMT	VendorTripLength	7.30	1.00
tblTripsAndVMT	VendorTripLength	7.30	1.00
tblTripsAndVMT	VendorTripLength	7.30	1.00
tblTripsAndVMT	VendorTripLength	7.30	1.00
tblTripsAndVMT	WorkerTripLength	10.80	1.00
tblTripsAndVMT	WorkerTripLength	10.80	1.00
tblTripsAndVMT	WorkerTripLength	10.80	1.00
tblTripsAndVMT	WorkerTripLength	10.80	1.00
tblTripsAndVMT	WorkerTripLength	10.80	1.00
tblTripsAndVMT	WorkerTripLength	10.80	1.00
tblTripsAndVMT	WorkerTripLength	10.80	1.00
tblTripsAndVMT	WorkerTripLength	10.80	1.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWoodstoves	NumberCatalytic	5.00	0.00
tblWoodstoves	NumberNoncatalytic	5.00	0.00
tblWoodstoves	WoodstoveDayYear	14.12	0.00
tblWoodstoves	WoodstoveWoodMass	582.40	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.3175	3.2224	2.2224	3.9800e-003	0.1534	0.1448	0.2982	0.0690	0.1362	0.2052	0.0000	357.6141	357.6141	0.0769	0.0000	359.5371
2020	1.7088	1.0505	0.9146	1.5800e-003	0.0107	0.0494	0.0601	2.9100e-003	0.0467	0.0496	0.0000	138.5430	138.5430	0.0288	0.0000	139.2617
Maximum	**1.7088**	**3.2224**	**2.2224**	**3.9800e-003**	**0.1534**	**0.1448**	**0.2982**	**0.0690**	**0.1362**	**0.2052**	**0.0000**	**357.6141**	**357.6141**	**0.0769**	**0.0000**	**359.5371**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.0958	1.8223	2.3706	3.9800e-003	0.0818	0.0108	0.0926	0.0204	0.0107	0.0311	0.0000	357.6138	357.6138	0.0769	0.0000	359.5368
2020	1.6346	0.6867	0.9810	1.5800e-003	0.0107	4.8500e-003	0.0156	2.9100e-003	4.8300e-003	7.7400e-003	0.0000	138.5429	138.5429	0.0288	0.0000	139.2616
Maximum	**1.6346**	**1.8223**	**2.3706**	**3.9800e-003**	**0.0818**	**0.0108**	**0.0926**	**0.0204**	**0.0107**	**0.0311**	**0.0000**	**357.6138**	**357.6138**	**0.0769**	**0.0000**	**359.5368**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**14.60**	**41.28**	**-6.84**	**0.00**	**43.66**	**91.94**	**69.83**	**67.57**	**91.50**	**84.74**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-1-2019**	**3-31-2019**	1.3982	0.6899
2	**4-1-2019**	**6-30-2019**	0.7063	0.4064
3	**7-1-2019**	**9-30-2019**	0.7141	0.4109
4	**10-1-2019**	**12-31-2019**	0.7121	0.4089

5	**1-1-2020**	**3-31-2020**	0.6446	0.3973
6	**4-1-2020**	**6-30-2020**	0.9352	0.7528
7	**7-1-2020**	**9-30-2020**	1.2067	1.2006
		Highest	1.3982	1.2006

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2019	2/11/2019	5	30	
2	Site Preparation	Site Preparation	2/12/2019	2/21/2019	5	8	
3	Grading	Grading	2/22/2019	3/21/2019	5	20	
4	Trenching	Trenching	2/22/2019	3/12/2019	5	13	Overlaping
5	Building Construction	Building Construction	3/22/2019	5/14/2020	5	300	
6	Paving	Paving	5/15/2020	6/18/2020	5	25	
7	Architectural Coating	Architectural Coating	6/20/2020	7/29/2020	5	28	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 0

Residential Indoor: 454,062; Residential Outdoor: 151,354; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area:

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Excavators	3	8.00	158	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Site Preparation	Rubber Tired Dozers	2	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38

Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	1	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Trenching	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	2	6.00	132	0.36
Paving	Rollers	2	6.00	80	0.38
Trenching	Excavators	1	8.00	158	0.38
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Architectural Coating	Aerial Lifts	1	6.00	63	0.31

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	15.00	0.00	138.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	4	10.00	0.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	0.00	5,100.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Building Construction	6	216.00	41.00	1,464.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Paving	8	20.00	0.00	44.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	2	43.00	0.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Trenching	2	5.00	0.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0143	0.0000	0.0143	2.1600e-003	0.0000	2.1600e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0527	0.5367	0.3309	5.8000e-004		0.0269	0.0269		0.0250	0.0250	0.0000	51.9395	51.9395	0.0145	0.0000	52.3007
Total	**0.0527**	**0.5367**	**0.3309**	**5.8000e-004**	**0.0143**	**0.0269**	**0.0412**	**2.1600e-003**	**0.0250**	**0.0272**	**0.0000**	**51.9395**	**51.9395**	**0.0145**	**0.0000**	**52.3007**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.7000e-004	7.0900e-003	2.2000e-003	1.0000e-005	6.0000e-005	1.0000e-005	7.0000e-005	2.0000e-005	1.0000e-005	3.0000e-005	0.0000	0.7351	0.7351	1.0000e-004	0.0000	0.7376
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.2000e-004	1.0000e-004	1.3600e-003	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1822	0.1822	1.0000e-005	0.0000	0.1824

Total	**3.9000e-004**	**7.1900e-003**	**3.5600e-003**	**1.0000e-005**	**2.3000e-004**	**1.0000e-005**	**2.4000e-004**	**6.0000e-005**	**1.0000e-005**	**8.0000e-005**	**0.0000**	**0.9173**	**0.9173**	**1.1000e-004**	**0.0000**	**0.9199**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.4200e-003	0.0000	6.4200e-003	4.9000e-004	0.0000	4.9000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.7600e-003	0.2034	0.3701	5.8000e-004		9.2000e-004	9.2000e-004		9.2000e-004	9.2000e-004	0.0000	51.9394	51.9394	0.0145	0.0000	52.3007
Total	**8.7600e-003**	**0.2034**	**0.3701**	**5.8000e-004**	**6.4200e-003**	**9.2000e-004**	**7.3400e-003**	**4.9000e-004**	**9.2000e-004**	**1.4100e-003**	**0.0000**	**51.9394**	**51.9394**	**0.0145**	**0.0000**	**52.3007**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.7000e-004	7.0900e-003	2.2000e-003	1.0000e-005	6.0000e-005	1.0000e-005	7.0000e-005	2.0000e-005	1.0000e-005	3.0000e-005	0.0000	0.7351	0.7351	1.0000e-004	0.0000	0.7376
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.2000e-004	1.0000e-004	1.3600e-003	0.0000	1.7000e-004	0.0000	1.7000e-004	4.0000e-005	0.0000	5.0000e-005	0.0000	0.1822	0.1822	1.0000e-005	0.0000	0.1824
Total	**3.9000e-004**	**7.1900e-003**	**3.5600e-003**	**1.0000e-005**	**2.3000e-004**	**1.0000e-005**	**2.4000e-004**	**6.0000e-005**	**1.0000e-005**	**8.0000e-005**	**0.0000**	**0.9173**	**0.9173**	**1.1000e-004**	**0.0000**	**0.9199**

3.3 Site Preparation - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0482	0.0000	0.0482	0.0265	0.0000	0.0265	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0109	0.1153	0.0527	9.0000e-005		5.9600e-003	5.9600e-003		5.4800e-003	5.4800e-003	0.0000	8.3677	8.3677	2.6500e-003	0.0000	8.4338
Total	**0.0109**	**0.1153**	**0.0527**	**9.0000e-005**	**0.0482**	**5.9600e-003**	**0.0541**	**0.0265**	**5.4800e-003**	**0.0320**	**0.0000**	**8.3677**	**8.3677**	**2.6500e-003**	**0.0000**	**8.4338**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	2.0000e-005	2.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0324	0.0324	0.0000	0.0000	0.0324
Total	**4.0000e-005**	**2.0000e-005**	**2.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0324**	**0.0324**	**0.0000**	**0.0000**	**0.0324**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Fugitive Dust					0.0217	0.0000	0.0217	5.9600e-003	0.0000	5.9600e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.6700e-003	0.0288	0.0550	9.0000e-005		1.5000e-004	1.5000e-004		1.5000e-004	1.5000e-004	0.0000	8.3677	8.3677	2.6500e-003	0.0000	8.4338
Total	**1.6700e-003**	**0.0288**	**0.0550**	**9.0000e-005**	**0.0217**	**1.5000e-004**	**0.0218**	**5.9600e-003**	**1.5000e-004**	**6.1100e-003**	**0.0000**	**8.3677**	**8.3677**	**2.6500e-003**	**0.0000**	**8.4338**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	2.0000e-005	2.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0324	0.0324	0.0000	0.0000	0.0324
Total	**4.0000e-005**	**2.0000e-005**	**2.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0324**	**0.0324**	**0.0000**	**0.0000**	**0.0324**

3.4 Grading - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0678	0.0000	0.0678	0.0340	0.0000	0.0340	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0258	0.2835	0.1629	3.0000e-004		0.0140	0.0140		0.0129	0.0129	0.0000	26.6423	26.6423	8.4300e-003	0.0000	26.8530
Total	**0.0258**	**0.2835**	**0.1629**	**3.0000e-004**	**0.0678**	**0.0140**	**0.0818**	**0.0340**	**0.0129**	**0.0469**	**0.0000**	**26.6423**	**26.6423**	**8.4300e-003**	**0.0000**	**26.8530**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.3500e-003	0.2622	0.0814	2.7000e-004	2.1800e-003	4.4000e-004	2.6300e-003	6.0000e-004	4.3000e-004	1.0300e-003	0.0000	27.1681	27.1681	3.5600e-003	0.0000	27.2571
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.5000e-004	7.0000e-005	9.1000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1215	0.1215	0.0000	0.0000	0.1216
Total	**6.5000e-003**	**0.2623**	**0.0823**	**2.7000e-004**	**2.2900e-003**	**4.4000e-004**	**2.7400e-003**	**6.3000e-004**	**4.3000e-004**	**1.0600e-003**	**0.0000**	**27.2895**	**27.2895**	**3.5600e-003**	**0.0000**	**27.3787**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0305	0.0000	0.0305	7.6600e-003	0.0000	7.6600e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.2000e-003	0.1033	0.1899	3.0000e-004		4.8000e-004	4.8000e-004		4.8000e-004	4.8000e-004	0.0000	26.6422	26.6422	8.4300e-003	0.0000	26.8530
Total	**5.2000e-003**	**0.1033**	**0.1899**	**3.0000e-004**	**0.0305**	**4.8000e-004**	**0.0310**	**7.6600e-003**	**4.8000e-004**	**8.1400e-003**	**0.0000**	**26.6422**	**26.6422**	**8.4300e-003**	**0.0000**	**26.8530**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.3500e-003	0.2622	0.0814	2.7000e-004	2.1800e-003	4.4000e-004	2.6300e-003	6.0000e-004	4.3000e-004	1.0300e-003	0.0000	27.1681	27.1681	3.5600e-003	0.0000	27.2571
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.5000e-004	7.0000e-005	9.1000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1215	0.1215	0.0000	0.0000	0.1216
Total	**6.5000e-003**	**0.2623**	**0.0823**	**2.7000e-004**	**2.2900e-003**	**4.4000e-004**	**2.7400e-003**	**6.3000e-004**	**4.3000e-004**	**1.0600e-003**	**0.0000**	**27.2895**	**27.2895**	**3.5600e-003**	**0.0000**	**27.3787**

3.5 Trenching - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	3.2100e-003	0.0327	0.0362	5.0000e-005		1.8600e-003	1.8600e-003		1.7100e-003	1.7100e-003	0.0000	4.8352	4.8352	1.5300e-003	0.0000	4.8734
Total	**3.2100e-003**	**0.0327**	**0.0362**	**5.0000e-005**		**1.8600e-003**	**1.8600e-003**		**1.7100e-003**	**1.7100e-003**	**0.0000**	**4.8352**	**4.8352**	**1.5300e-003**	**0.0000**	**4.8734**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	2.0000e-005	2.0000e-004	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0263	0.0263	0.0000	0.0000	0.0263
Total	**3.0000e-005**	**2.0000e-005**	**2.0000e-004**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0263**	**0.0263**	**0.0000**	**0.0000**	**0.0263**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	8.7000e-004	0.0236	0.0408	5.0000e-005		9.0000e-005	9.0000e-005		9.0000e-005	9.0000e-005	0.0000	4.8352	4.8352	1.5300e-003	0.0000	4.8734
Total	**8.7000e-004**	**0.0236**	**0.0408**	**5.0000e-005**		**9.0000e-005**	**9.0000e-005**		**9.0000e-005**	**9.0000e-005**	**0.0000**	**4.8352**	**4.8352**	**1.5300e-003**	**0.0000**	**4.8734**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	2.0000e-005	2.0000e-004	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0263	0.0263	0.0000	0.0000	0.0263
Total	**3.0000e-005**	**2.0000e-005**	**2.0000e-004**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0263**	**0.0263**	**0.0000**	**0.0000**	**0.0263**

3.6 Building Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1865	1.6420	1.2952	2.1500e-003		0.0946	0.0946		0.0897	0.0897	0.0000	185.9854	185.9854	0.0415	0.0000	187.0223
Total	**0.1865**	**1.6420**	**1.2952**	**2.1500e-003**		**0.0946**	**0.0946**		**0.0897**	**0.0897**	**0.0000**	**185.9854**	**185.9854**	**0.0415**	**0.0000**	**187.0223**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.2300e-003	0.0509	0.0158	5.0000e-005	5.7000e-004	9.0000e-005	6.6000e-004	1.5000e-004	8.0000e-005	2.4000e-004	0.0000	5.2772	5.2772	6.9000e-004	0.0000	5.2945
Vendor	8.7900e-003	0.2817	0.1100	2.9000e-004	3.8100e-003	7.5000e-004	4.5600e-003	1.1100e-003	7.2000e-004	1.8300e-003	0.0000	28.5492	28.5492	3.3200e-003	0.0000	28.6320
Worker	0.0213	0.0102	0.1323	2.0000e-004	0.0162	2.2000e-004	0.0164	4.3300e-003	2.0000e-004	4.5300e-003	0.0000	17.7523	17.7523	7.1000e-004	0.0000	17.7700
Total	**0.0313**	**0.3428**	**0.2581**	**5.4000e-004**	**0.0206**	**1.0600e-003**	**0.0216**	**5.5900e-003**	**1.0000e-003**	**6.6000e-003**	**0.0000**	**51.5786**	**51.5786**	**4.7200e-003**	**0.0000**	**51.6965**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0410	0.8509	1.3704	2.1500e-003		7.6300e-003	7.6300e-003		7.6300e-003	7.6300e-003	0.0000	185.9852	185.9852	0.0415	0.0000	187.0221
Total	**0.0410**	**0.8509**	**1.3704**	**2.1500e-003**		**7.6300e-003**	**7.6300e-003**		**7.6300e-003**	**7.6300e-003**	**0.0000**	**185.9852**	**185.9852**	**0.0415**	**0.0000**	**187.0221**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.2300e-003	0.0509	0.0158	5.0000e-005	5.7000e-004	9.0000e-005	6.6000e-004	1.5000e-004	8.0000e-005	2.4000e-004	0.0000	5.2772	5.2772	6.9000e-004	0.0000	5.2945
Vendor	8.7900e-003	0.2817	0.1100	2.9000e-004	3.8100e-003	7.5000e-004	4.5600e-003	1.1100e-003	7.2000e-004	1.8300e-003	0.0000	28.5492	28.5492	3.3200e-003	0.0000	28.6320
Worker	0.0213	0.0102	0.1323	2.0000e-004	0.0162	2.2000e-004	0.0164	4.3300e-003	2.0000e-004	4.5300e-003	0.0000	17.7523	17.7523	7.1000e-004	0.0000	17.7700
Total	**0.0313**	**0.3428**	**0.2581**	**5.4000e-004**	**0.0206**	**1.0600e-003**	**0.0216**	**5.5900e-003**	**1.0000e-003**	**6.6000e-003**	**0.0000**	**51.5786**	**51.5786**	**4.7200e-003**	**0.0000**	**51.6965**

3.6 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0800	0.7153	0.6059	1.0300e-003		0.0392	0.0392		0.0371	0.0371	0.0000	87.7254	87.7254	0.0195	0.0000	88.2116

Total	**0.0800**	**0.7153**	**0.6059**	**1.0300e-003**		**0.0392**	**0.0392**		**0.0371**	**0.0371**	**0.0000**	**87.7254**	**87.7254**	**0.0195**	**0.0000**	**88.2116**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-004	0.0232	7.2600e-003	2.0000e-005	5.1000e-004	3.0000e-005	5.4000e-004	1.3000e-004	3.0000e-005	1.6000e-004	0.0000	2.5143	2.5143	3.0000e-004	0.0000	2.5218
Vendor	3.5600e-003	0.1274	0.0491	1.4000e-004	1.8200e-003	2.4000e-004	2.0600e-003	5.3000e-004	2.3000e-004	7.6000e-004	0.0000	13.5940	13.5940	1.4400e-003	0.0000	13.6301
Worker	9.2000e-003	4.2500e-003	0.0564	9.0000e-005	7.7300e-003	1.0000e-004	7.8300e-003	2.0700e-003	1.0000e-004	2.1700e-003	0.0000	8.2187	8.2187	2.9000e-004	0.0000	8.2260
Total	**0.0133**	**0.1548**	**0.1128**	**2.5000e-004**	**0.0101**	**3.7000e-004**	**0.0104**	**2.7300e-003**	**3.6000e-004**	**3.0900e-003**	**0.0000**	**24.3269**	**24.3269**	**2.0300e-003**	**0.0000**	**24.3779**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0196	0.4066	0.6548	1.0300e-003		3.6400e-003	3.6400e-003		3.6400e-003	3.6400e-003	0.0000	87.7253	87.7253	0.0195	0.0000	88.2115
Total	**0.0196**	**0.4066**	**0.6548**	**1.0300e-003**		**3.6400e-003**	**3.6400e-003**		**3.6400e-003**	**3.6400e-003**	**0.0000**	**87.7253**	**87.7253**	**0.0195**	**0.0000**	**88.2115**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-004	0.0232	7.2600e-003	2.0000e-005	5.1000e-004	3.0000e-005	5.4000e-004	1.3000e-004	3.0000e-005	1.6000e-004	0.0000	2.5143	2.5143	3.0000e-004	0.0000	2.5218
Vendor	3.5600e-003	0.1274	0.0491	1.4000e-004	1.8200e-003	2.4000e-004	2.0600e-003	5.3000e-004	2.3000e-004	7.6000e-004	0.0000	13.5940	13.5940	1.4400e-003	0.0000	13.6301
Worker	9.2000e-003	4.2500e-003	0.0564	9.0000e-005	7.7300e-003	1.0000e-004	7.8300e-003	2.0700e-003	1.0000e-004	2.1700e-003	0.0000	8.2187	8.2187	2.9000e-004	0.0000	8.2260
Total	**0.0133**	**0.1548**	**0.1128**	**2.5000e-004**	**0.0101**	**3.7000e-004**	**0.0104**	**2.7300e-003**	**3.6000e-004**	**3.0900e-003**	**0.0000**	**24.3269**	**24.3269**	**2.0300e-003**	**0.0000**	**24.3779**

3.7 Paving - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0148	0.1475	0.1535	2.4000e-004		8.1400e-003	8.1400e-003		7.5100e-003	7.5100e-003	0.0000	20.4650	20.4650	6.4300e-003	0.0000	20.6258
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0148**	**0.1475**	**0.1535**	**2.4000e-004**		**8.1400e-003**	**8.1400e-003**		**7.5100e-003**	**7.5100e-003**	**0.0000**	**20.4650**	**20.4650**	**6.4300e-003**	**0.0000**	**20.6258**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	5.0000e-005	2.1500e-003	6.7000e-004	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.2337	0.2337	3.0000e-005	0.0000	0.2344
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.2000e-004	1.0000e-004	1.3500e-003	0.0000	1.8000e-004	0.0000	1.9000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1961	0.1961	1.0000e-005	0.0000	0.1963
Total	**2.7000e-004**	**2.2500e-003**	**2.0200e-003**	**0.0000**	**2.0000e-004**	**0.0000**	**2.1000e-004**	**6.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.4298**	**0.4298**	**4.0000e-005**	**0.0000**	**0.4307**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	3.6400e-003	0.0981	0.1692	2.4000e-004		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004	0.0000	20.4650	20.4650	6.4300e-003	0.0000	20.6258
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.6400e-003**	**0.0981**	**0.1692**	**2.4000e-004**		**3.7000e-004**	**3.7000e-004**		**3.7000e-004**	**3.7000e-004**	**0.0000**	**20.4650**	**20.4650**	**6.4300e-003**	**0.0000**	**20.6258**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-005	2.1500e-003	6.7000e-004	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.2337	0.2337	3.0000e-005	0.0000	0.2344
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	2.2000e-004	1.0000e-004	1.3500e-003	0.0000	1.8000e-004	0.0000	1.9000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1961	0.1961	1.0000e-005	0.0000	0.1963
Total	**2.7000e-004**	**2.2500e-003**	**2.0200e-003**	**0.0000**	**2.0000e-004**	**0.0000**	**2.1000e-004**	**6.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.4298**	**0.4298**	**4.0000e-005**	**0.0000**	**0.4307**

3.8 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.5962					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.8100e-003	0.0303	0.0371	6.0000e-005		1.7000e-003	1.7000e-003		1.6900e-003	1.6900e-003	0.0000	5.1236	5.1236	7.8000e-004	0.0000	5.1430
Total	**1.6000**	**0.0303**	**0.0371**	**6.0000e-005**		**1.7000e-003**	**1.7000e-003**		**1.6900e-003**	**1.6900e-003**	**0.0000**	**5.1236**	**5.1236**	**7.8000e-004**	**0.0000**	**5.1430**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.3000e-004	2.4000e-004	3.2400e-003	1.0000e-005	4.4000e-004	1.0000e-005	4.5000e-004	1.2000e-004	1.0000e-005	1.2000e-004	0.0000	0.4723	0.4723	2.0000e-005	0.0000	0.4727
Total	**5.3000e-004**	**2.4000e-004**	**3.2400e-003**	**1.0000e-005**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**1.2000e-004**	**1.0000e-005**	**1.2000e-004**	**0.0000**	**0.4723**	**0.4723**	**2.0000e-005**	**0.0000**	**0.4727**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	1.5962					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2000e-003	0.0248	0.0390	6.0000e-005		4.6000e-004	4.6000e-004		4.6000e-004	4.6000e-004	0.0000	5.1236	5.1236	7.8000e-004	0.0000	5.1430
Total	**1.5974**	**0.0248**	**0.0390**	**6.0000e-005**		**4.6000e-004**	**4.6000e-004**		**4.6000e-004**	**4.6000e-004**	**0.0000**	**5.1236**	**5.1236**	**7.8000e-004**	**0.0000**	**5.1430**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.3000e-004	2.4000e-004	3.2400e-003	1.0000e-005	4.4000e-004	1.0000e-005	4.5000e-004	1.2000e-004	1.0000e-005	1.2000e-004	0.0000	0.4723	0.4723	2.0000e-005	0.0000	0.4727
Total	**5.3000e-004**	**2.4000e-004**	**3.2400e-003**	**1.0000e-005**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**1.2000e-004**	**1.0000e-005**	**1.2000e-004**	**0.0000**	**0.4723**	**0.4723**	**2.0000e-005**	**0.0000**	**0.4727**

Attachment 4: Construction Health Risk Modeling

Artisan Crossing, Belmont, CA

DPM Emissions and Modeling Emission Rates - With Mitigation

Construction Year	Activity	DPM (ton/year)	Area Source	DPM Emissions (lb/yr)	DPM Emissions (lb/hr)	DPM Emissions (g/s)	Modeled Area (m^2)	DPM Emission Rate ($g/s/m^2$)
2019	Construction	0.0096	DPM_A1	19.2	0.00586	7.38E-04	7,586	9.73E-08
	Construction	0.0012	DPM_A2	2.4	0.00072	9.04E-05	929	9.73E-08
		0.0108		21.6	0.00658	8.28E-04	8,516	
2020	Construction	0.0043	DPM_A1	8.6	0.00263	3.31E-04	7,586	4.37E-08
	Construction	0.0005	DPM_A2	1.1	0.00032	4.06E-05	929	4.37E-08
		0.0049		9.7	0.00295	3.72E-04	8,516	
Total		***0.0157***		***31.3***	***0.0095***	***0.0012***		

Operation Hours

hr/day =	9	(7am - 4pm)
days/yr =	365	
hours/year =	3285	

PM2.5 Fugitive Dust Emissions for Modeling - With Mitigation

Construction Year	Activity	Area Source	PM2.5 Emissions (ton/year)	PM2.5 Emissions (lb/yr)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (g/s)	Modeled Area (m^2)	PM2.5 Emission Rate $g/s/m^2$
2019	Construction	FUG_A1	0.0182	36.3	0.01106	1.39E-03	7,586	1.84E-07
	Construction	FUG_A2	0.0022	4.5	0.00136	1.71E-04	929	1.84E-07
			0.0204	40.8	1.24E-02	1.56E-03	8,516	
2020	Construction	FUG_A1	0.0026	5.2	0.00158	1.99E-04	7,586	2.62E-08
	Construction	FUG_A2	0.0003	0.6	0.00019	2.44E-05	929	2.62E-08
			0.0029	5.8	1.77E-03	2.23E-04	8,516	
Total			***0.0233***	***46.6***	***0.0142***	***0.0018***		

Operation Hours

hr/day =	9	(7am - 4pm)
days/yr =	365	
hours/year =	3285	

Artisan Crossing, Belmont, CA
Construction Health Impacts Summary

Maximum Impacts at Construction MEI Location - Mitigated

Emissions Year	Maximum Concentrations: Exhaust PM10/DPM ($\mu g/m^3$)	Maximum Concentrations: Fugitive PM2.5 ($\mu g/m^3$)	Cancer Risk (per million): Child	Cancer Risk (per million): Adult	Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu g/m^3$)
2019	0.0326	0.0829	5.35	0.09	0.007	0.12
2019	0.0146	0.0118	2.40	0.04	0.003	0.03
Total	-	-	**7.7**	**0.1**	-	-
Maximum	0.0326	0.0829	-	-	**0.01**	**0.12**

Artisan Crossing, Belmont, CA - With Mitigation
Maximum DPM Cancer Risk Calculations From Construction - With Mitigation
Impacts at Off-Site Receptors-1.5 meter

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$
ASF = Age sensitivity factor for specified age group
ED = Exposure duration (years)
AT = Averaging time for lifetime cancer risk (years)
FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10^{-6}

Where: C_{air} = concentration in air $(\mu g/m^3)$
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
10^{-6} = Conversion factor

Values

	Infant/Child				Adult
Age -->	**3rd Trimester**	**0 - 2**	**2 - 9**	**2 - 16**	**16 - 30**
Parameter					
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	631	572	261
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	1.00	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

			Infant/Child - Exposure Information			Infant/Child	Adult - Exposure Information			Adult		
							Modeled					
Exposure	**Exposure Duration**		**DPM Conc (ug/m3)**		**Age Sensitivity**	**Cancer Risk**	**DPM Conc (ug/m3)**		**Age Sensitivity**	**Cancer Risk**	**Fugitive**	**Total**
Year	**(years)**	**Age**	**Year**	**Annual**	**Factor**	**(per million)**	**Year**	**Annual**	**Factor**	**(per million)**	**PM2.5**	**PM2.5**
0	0.25	-0.25 - 0*	-	-	10	-	-	-	-	-		
1	1	0 - 1	2019	0.0326	10	5.35	2019	0.0326	1	0.09	0.083	0.115
2	1	1 - 2	2020	0.0146	10	2.40	2020	0.0146	1	0.04	0.012	0.026
3	1	2 - 3		0.0000	3	0.00		0.0000	1	0.00		
4	1	3 - 4		0.0000	3	0.00		0.0000	1	0.00		
5	1	4 - 5		0.0000	3	0.00		0.0000	1	0.00		
6	1	5 - 6		0.0000	3	0.00		0.0000	1	0.00		
7	1	6 - 7		0.0000	3	0.00		0.0000	1	0.00		
8	1	7 - 8		0.0000	3	0.00		0.0000	1	0.00		
9	1	8 - 9		0.0000	3	0.00		0.0000	1	0.00		
10	1	9 - 10		0.0000	3	0.00		0.0000	1	0.00		
11	1	10 - 11		0.0000	3	0.00		0.0000	1	0.00		
12	1	11 - 12		0.0000	3	0.00		0.0000	1	0.00		
13	1	12 - 13		0.0000	3	0.00		0.0000	1	0.00		
14	1	13 - 14		0.0000	3	0.00		0.0000	1	0.00		
15	1	14 - 15		0.0000	3	0.00		0.0000	1	0.00		
16	1	15 - 16		0.0000	3	0.00		0.0000	1	0.00		
17	1	16-17		0.0000	1	0.00		0.0000	1	0.00		
18	1	17-18		0.0000	1	0.00		0.0000	1	0.00		
19	1	18-19		0.0000	1	0.00		0.0000	1	0.00		
20	1	19-20		0.0000	1	0.00		0.0000	1	0.00		
21	1	20-21		0.0000	1	0.00		0.0000	1	0.00		
22	1	21-22		0.0000	1	0.00		0.0000	1	0.00		
23	1	22-23		0.0000	1	0.00		0.0000	1	0.00		
24	1	23-24		0.0000	1	0.00		0.0000	1	0.00		
25	1	24-25		0.0000	1	0.00		0.0000	1	0.00		
26	1	25-26		0.0000	1	0.00		0.0000	1	0.00		
27	1	26-27		0.0000	1	0.00		0.0000	1	0.00		
28	1	27-28		0.0000	1	0.00		0.0000	1	0.00		
29	1	28-29		0.0000	1	0.00		0.0000	1	0.00		
30	1	29-30		0.0000	1	0.00		0.0000	1	0.00		
Total Increased Cancer Risk						**7.7**				**0.1**		

* Third trimester of pregnancy

Risk at Construction MEI

				Screening Source Level			Predicted Level			
Distance	**Plant No.**	**Name**	**Address**	**Cancer Risk**	**Hazard Index**	**PM2.5**	**Cancer Risk**	**Hazard Index**	**PM2.5**	Comments
0	546	Peterson Products, Inc	1325 OLD COUNTY RD	0	0.021	0.42	0.00	0.00	0.00	Site will close
500	G9133	Belmont Apollo Inc	701 Harbor Boulevard	11.549	0.019	0	0.69	0.00	0.00	GDF
700	G10968	Peninsula Cardlock	610 Harbor Boulevard	8.315	0.014	0	0.31	0.00	0.00	GDF
1000	12166	Moquin Press Inc	555 HARBOR BOULEVARD	0.98	0.003	0	1.35	0.00	0.00	
1000	15882	County of San Mateo	400 HARBOR BLVD, BLDG C	32.62	0.012	0.008	1.79	0.00	0.00	Generator
Sources:	18106, 16113, 16625,11643,14107, 5141, 4861, 8335, and 18227			have pose no health risk.						

Diesel BUG Distance Multiplier

Distance feet	multiplier
82	0.85
98	0.73
115	0.64
131	0.58
164	0.5
197	0.41
230	0.31
262	0.28
295	0.25
328	0.22
361	0.18
394	0.16
426	0.15
459	0.14
492	0.12
525	0.1
590	0.09
656	0.08
722	0.07
787	0.06
853	0.05
918	0.04

GDF Distance Multiplier

Distance feet	multiplier	Distance feet	multiplier
66	1	426	0.06
82	0.73	443	0.05
98	0.56	459	0.05
115	0.45	476	0.05
131	0.36	492	0.05
148	0.31	508	0.04
164	0.26	525	0.04
180	0.22	541	0.04
197	0.20	558	0.04
213	0.17	574	0.04
230	0.15	590	0.03
246	0.14	607	0.03
262	0.13	623	0.03
279	0.11	640	0.03
295	0.10	656	0.03
312	0.10	672	0.03
328	0.09	689	0.03
344	0.08	705	0.03
361	0.08	722	0.02
377	0.07	738	0.02
394	0.07	754	0.02
410	0.06	771	0.02

Project Name: Artisan Crossing - 1325 Old County Rd

Complete ALL Portions in Yellow

Project Size 250 Dwelling Units | 2.09 total project acres disturbed

_____ s.f. residential | _____ s.f. retail

_____ s.f. office/commercial | _____ s.f. other, specify:

_____ s.f. other, specify:

_____ s.f. parking garage | _____ spaces

_____ s.f. parking lot | _____ spaces

Construction Hours am to pm

Qty	Description	HP	Load Factor	Hours/day	Total Work Days	Avg. Hours per day	Comments
	Demolition	**Start Date:**	*e.g., 9/1/2018*	**Total phase:**	**30**		**Overall Import/Export Volumes**
		End Date:					
1	Concrete/Industrial Saws	81	0.73	8	30	8	**Demolition Volume**
3	Excavators	162	0.38	8	30	8	Square footage of buildings to be demolished
2	Rubber-Tired Dozers	255	0.4	8	30	8	(*or* total tons to be hauled)
	Tractors/Loaders/Backhoes	97	0.37			0	29,000 square feet *or*
							_?_ Hauling volume (tons)
	Site Preperation	**Start Date:**		**Total phase:**	**8**		Any pavement demolished and hauled 15 **tons**
		End Date:					**Soil Hauling Volume**
	Graders	174	0.41			0	
2	Rubber Tired Dozers	255	0.4	8	8	8	Export volume = **_0_** cubic yards
2	Tractors/Loaders/Backhoes	97	0.37	8	8	8	Import volume = **_0_** cubic yards
	Grading / Excavation	**Start Date:**		**Total phase:**	**20**		
		End Date:					**Soil Hauling Volume**
	Scrapers	**361**	**0.48**			0	
1	Excavators	162	0.38	8	20	8	Export volume = **_40,800_** cubic yards
1	Graders	174	0.41	8	20	8	Import volume = **_0_** cubic yards
1	Rubber Tired Dozers	255	0.4	8	20	8	
3	Tractors/Loaders/Backhoes	97	0.37	8	20	8	
	Other Equipment?						
	Trenching	**Start Date:**		**Total phase:**	**13**		
		End Date:					
1	Tractor/Loader/Backhoe	97	0.37	8	13	8	
1	Excavators	162	0.38	8	13	8	
	Other Equipment?						
	Building - Exterior	**Start Date:**		**Total phase:**	**300**		**Cement Trucks? _732_ Total Round-Trips**
		End Date:					
1	Cranes	226	0.29	7	300	7	Electric? (Y/N) Y Otherwise assumed diesel
1	Forklifts	89	0.2	8	300	8	Liquid Propane (LPG)? (Y/N) N Otherwise Assumed diesel
1	Generator Sets	84	0.74	8	300	8	Or temporary line power? (Y/N) Y
2	Tractors/Loaders/Backhoes	97	0.37	7	300	7	otherwise, assume diesel generator
1	Welders	46	0.45	8	300	8	
	Other Equipment?					0	
	Building - Interior/Architectural Coating	**Start Date:**		**Total phase:**	**28**		
		End Date:					
1	Air Compressors	78	0.48	6	28	6	
1	Aerial Lift	62	0.31	6	28	6	
	Other Equipment?						
	Paving	**Start Date:**		**Total phase:**	**25**		
		Start Date:					
2	Cement and Mortar Mixers	9	0.56	6	25	6	
1	Pavers	125	0.42	8	25	8	**Asphalt? 222 cubic yards or ____ round trips?**
2	Paving Equipment	130	0.36	6	25	6	
2	Rollers	80	0.38	6	25	6	
1	Tractors/Loaders/Backhoes	97	0.37	8	25	8	
	Other Equipment?						

Equipment listed in this sheet is to provide an example of inputs

It is assumed that water trucks would be used during grading

Add or subtract phases and equipment, as appropriate

Modify horepower or load factor, as appropriate

Typical Equipment Type & Load Factors

OFFROAD Equipment Type	HP	Load Factor
Aerial Lifts	62	0.31
Air Compressors	78	0.48
Bore/Drill Rigs	205	0.5
Cement and Mortar Mixers	9	0.56
Concrete/Industrial Saws	81	0.73
Cranes	226	0.29
Crawler Tractors	208	0.43
Crushing/Proc. Equipment	85	0.78
Dumpers/Tenders	16	0.38
Excavators	162	0.38
Forklifts	89	0.2
Generator Sets	84	0.74
Graders	174	0.41
Off-Highway Tractors	122	0.44
Off-Highway Trucks	400	0.38
Other Construction Equipment	171	0.42
Other General Industrial Equipment	150	0.34
Other Material Handling Equipment	167	0.4
Pavers	125	0.42
Paving Equipment	130	0.36
Plate Compactors	8	0.43
Pressure Washers	13	0.2
Pumps	84	0.74
Rollers	80	0.38
Rough Terrain Forklifts	100	0.4
Rubber Tired Dozers	255	0.4
Rubber Tired Loaders	199	0.36
Scrapers	361	0.48
Signal Boards	6	0.82
Skid Steer Loaders	64	0.37
Surfacing Equipment	253	0.3
Sweepers/Scrubbers	64	0.46
Tractors/Loaders/Backhoes	97	0.37
Trenchers	80	0.5
Welders	46	0.45